Appendix A Existing Utilities

Summary of Existing Utilities

Utilities along Huron Church/Talbot					ALTE	RNATIVE 1A/1B					
Corridor	Length (m)	Howard to Cousineau	Cousineau Crossing (m)	Length (m)	Cousineau to Cabana	Cabana Crossing (m)	Length (m)	Cabana to Lambton	Lambton Crossing (m)	Length (m)	Lambton to E.C. Row
TELECOM											
Bell Canada - Underground	520	South	670	480	Existing Huron/Church	850	1030	North	450	300	North
							1400	South		630 840	South
Bell Canada - Overhead	1420	North		950	North	490	200	Crossing		180	Crossing
	850	South		350	South			5 5 5 5			
				100	Existing Huron/Church						
GAS							(000				2
Union Gas - Major	950 1200	North	300	930	North	685	1260	North	750	880	Crossing
	400	Crossing		740	Existing Huron/Church		940	Crossing		900	North
Union Gas - Minor	350	Crossing	50	120	Existing Huron/Church	100	150	Crossing	20	200	Crossing
				150	Crossing						
E.L.K. Energy - Major											
ELK Energy - Minor											
BP Gas - Major											
BP Gas - Minor											
MUNICIPAL											
City of Windsor - Storm									200	445	Creasing
375 DIA.									260	115	North
450 DIA.										81	Crossing
										67	North
525 DIA.										175	Crossing
600 DIA				140	Nath		40	Crocsis			North
UUU DIA.				110	ινοπη		43 62	North			North
							103	South			Nortan
675 DIA.							127	North		121	Crossing
							91	South		27	North
750 DIA.							122	North			Crossing
							224 414	South		86	Crossing
							324	South		91	North
1050 DIA.							33	Crossing		146	Crossing
										89	North
1200 DIA.							111	North			
1350 DIA.							95	North			
City of Windsor - Sanitary											
200 DIA.							140	South			
250 DIA	130	North		200	North		145	North		33	Crossing
230 DIA.	150	North		290	North		145	North			Crossing
300 DIA.									245		
375 DIA.							196	Crossing		120	Crossing
City of Windson - Watermain										730	South
100 DIA.											
150 DIA.											
200 DIA.	1252	North		166	North		120	Crossing	100	530	Crossing
250 DIA	330	South					1250	Couth		710	Couth
200 DIA.							1350	South		710	Crossing
300 DIA.	1								240		0.000mg
400 DIA.				200	Crossing					390	Crossing
600 DIA.				200	Crossing					390	Crossing
HYDRO Enwin- Overhead			200				1200	South	600	900	South
			200				600	Crossing	000	300	300011
Enwin - Underground	1600	North in		2100	North in	600	90	Crossing			
	1400	North out		2100	North out						
Hydro One - Major			270								
Hydro One - Millior Hydro One - Transmission			370 1743								
Essex Power - Major	1000	South		1420	South	400					
Essex Power - Minor											
OTHERS											
District Energy - Windsor Utilities											
MaXess Networks - Fibre Optics - Major							750	South	400		
							265	Crossing			
MaXess Networks - Fibre Optics - Minor											
Detriot and Canada Tunnel	1										
Canadian Transit Corporation											
Total Length of Litility moved (km)	11.4		33	10.6		3.1	13.8		3.1	9.0	
rotar Longar of Otality moved (kin)	- 1.9		0.0	-10.0		0.1	-13.0		5.1	3.0	

Summary of Existing Utilities

					ALTER	NATIVE 2A/2B					
Utilities along Huron Church/Talbot Corridor	Length (m)	Howard to	Cousineau	Length (m)	Cousineau to Cabana	Cabana Crossing	Length (m)	Cabana to	Lambton	Length (m)	Lambton to E.C.
	Longar (m)	Cousineau	Crossing (m)	Longin (iii)	Cousineau to Cabana	(m)	Longui (iii)	Lambton	Crossing (m)	Echigan (m)	Row
TELECOM	500	0	070	400	Evistia a Ukura /Ohurah	050	0	N I - utile	450	0	N I - utile
Bell Canada - Underground	523	South	670	480	Existing Huron/Church	850	0	North	450	0	North
							600	Crossing		780	Crossing
Bell Canada - Overhead	1420	North		350	North	800	200	Crossing		180	Crossing
Dell Callada - Overhead	850	South		100	Existing Huron/Church	000	200	Crossing		100	Crossing
GAS	000	Coun	-	100	Existing haron/onaron						
Union Gas - Maior	950	North	300	225	North	600	660	Crossing	750	880	Crossing
	1200	South		740	Existing Huron/Church			g		330	North
	400	Crossing									
Union Gas - Minor	350	Crossing	50	100	Existing Huron/Church	350	120	Crossing	20	200	Crossing
		5		30	Crossing						Ŭ
E.L.K. Energy - Major			-								
E.L.K. Energy - Minor											
BP Gas - Major											
BP Gas - Minor											
MUNICIPAL											
City of Windsor - Storm											
300 DIA.	65	North									
375 DIA.	108	North							260	115	Crossing
450 DIA.	47	North								81	Crossing
525 DIA.										175	Crossing
600 DIA.							43	Crossing			Crossing
675 DIA.										121	Crossing
750 DIA.											Crossing
900 DIA.											Crossing
1050 DIA.							33	Crossing		146	Crossing
1200 DIA.											
1350 DIA.											
City of Windsor - Sanitary											
200 DIA.	400	N. 4					140	North			
250 DIA.	130	North							120	33	Crossing
300 DIA.							22	Crossing	130	120	Crossing
375 DIA. City of Windoor Watermain							32	Crossing		120	Crossing
150 DIA											
200 DIA	1252	North					120	Crossing	100	350	Crossing
200 DIA.	330	South					120	Crossing	100	000	orossing
250 DIA.	000	oouur					1350	North		710	North
										78	Crossing
300 DIA.									240		0
400 DIA.				200	Crossing					390	Crossing
600 DIA.				200	Crossing					390	Crossing
HYDRO											
Enwin- Overhead							600	Crossing	600	500	North
Enwin - Underground						1200	90	Crossing			
Hydro One - Major											
Hydro One - Minor											
Hydro One - Transmission											
Essex Power - Major	1000	South		1420	North	400					
Essex Power - Minor											
OTHERS											
District Energy - Windsor Utilities											
MaXess Networks - Fibre Optics - Major							265	Crossing	400		
MaXess Networks - Fibre Optics - Minor											
Detriot and Canada Tunnel											
Canadian Transit Corporation											
Total Length of Utility moved	8.6	0	1.0	3.8		4.2	4.3		3.0	5.6	

Litilities along Huron Church/Talbot Corridor					ALTE	ERNATIVE 3					
	Length (m)	Howard to Cousineau	Cousineau Crossing (m)	Length (m)	Cousineau to Cabana	Cabana Crossing (m)	Length (m)	Cabana to Lambton	Lambton Crossing (m)	Length (m)	Lambton to E.C. Row
TELECOM		• 								 '	
Bell Canada - Underground	523	South	670	480	Existing Huron/Church	850	1030	North	450	300	North
		L				'	1400	South		630	South
		L				'	1780	Crossing		840	Crossing
Bell Canada - Overhead	1420 850	North South		950 350	North South	490	200	Crossing	-	180	Crossing
				100	Existing Huron/Church					· '	<u> </u>
GAS						<u>'</u>				l'	
Union Gas - Major	1200	North	260	930	North	685	1260	North	750	880	Crossing
	450	Crossing		200	Crossing	<u> </u>	270	South		980	North
		. <u> </u>		740	Existing Huron/Church	1	940	Crossing			
Union Gas - Minor	350	Crossing	50	120 150	Existing Huron/Church Crossing	100	150	Crossing	20	200	Crossing
E.L.K. Energy - Major					·	1				1	
E.L.K. Energy - Minor		. <u></u> i				1 '					I
BP Gas - Major						1			-	1	
BP Gas - Minor	1	. <u></u> i				1			-	1	
MUNICIPAL		 I				1			-	1	
Citv of Windsor - Storm		 I	1	+		1	1		-	1	
375 DIA.		·				1			260	115	Crossing
		·		+		1				120	North
450 DIA	ł	 I	+	+			1		-	81	Crossing
-50 Dir.	 +	·		++			I		-	67	North
	++	1		+		·'	I −−−+		-	175	Crossing
525 DIA.	 +	I	+	+		·'	I		-		North
	╂───┼	 I		110	North	·}'	43	Crossing	-	'	Crossing
000 DIA.	┨────┼			110	INUIUI	·] '	40 60	North	-	'	North
				++		- <u> </u> '	103	NUITI	-	'	INULUI
075 014	┨────┼		 			'	103	Soutri	-	401	Oreceipa
675 DIA.	┨────┼	1		I		'	12/		-	121	Crossing
			_	_ +		- '	91	South	_	27	North
750 DIA.	┨────┼			┨───┼		- '	122	North	-		Crossing
	I		_	I +		- '	224	South	-	86	North
900 DIA.	┫────┤	·		I		_ _ '	414	North	_	'	Crossing
						_ _ '	324	South	_	91	North
1050 DIA.						'	33	Crossing		146	Crossing
		<u>ــــــــــــــــــــــــــــــــــــ</u>				'				89	North
1200 DIA.		L				'	111	North		'	
		L					152	South		'	
1350 DIA.		L					95	North			
		·	Γ			Γ'	Γ		Τ	Γ'	[]
City of Windsor - Sanitary		·				<u> </u>				<u>'</u>	
200 DIA.		·				<u> </u>	140	South		· '	
		·				<u> </u>				l'	
250 DIA.		·		290	North	· [145	North		33	Crossing
		. <u> </u>									
300 DIA.		. <u></u> i				1			245	1	1
				1		1				1	
375 DIA.	1	. <u></u> i				1	196	Crossing	-	120	Crossing
		·				1			-	730	South
Citv of Windsor - Watermain		. <u></u> i				1			-	1	
100 DIA.		. <u></u> i				1			-	1	
150 DIA	 +	 I		+		1	t		-	1	
	1252	North		166	North	'	120	Crossing	100	530	Crossing
	330	South	+	66	Crossing	·'	120	Ologonig		000	Crossing
	550				Clossing	· '	1350	South	-	710	South
250 DIA.				++		- <u>+</u> '	1550	South	-	79	Crossing
	┨────┼					'				/٥	Crossing
300 DIA.	┨────┼					- '	┨────┼		240		
400 DIA.		r		200	Crossing	- '	I		_	390	Crossing
600 DIA.		r		200	Crossing	- <u> </u> '			_	390	Crossing
HYDRO		·		┨───┼		'			_	 '	ļl
Enwin- Overhead			200	┫		_ _ ′	1200	South	600	900	South
		i.					600	Crossing			1

Summary of Existing Utilities

								-			
Enwin - Underground	1600	North in		2100	North in	600	90	Crossing			
				1140	North out						
Hydro One - Major											
Hydro One - Minor											
Hydro One - Transmission											
Essex Power - Major	1000	South		1420	South	400					
Essex Power - Minor											
OTHERS											
District Energy - Windsor Utilities											
MaXess Networks - Fibre Optics - Major							750	South	400		
							265	Crossing			
MaXess Networks - Fibre Optics - Minor											
Detriot and Canada Tunnel											
Canadian Transit Corporation											
Total Length of Utility moved	9.0		1.2	9.7		3.1	13.8		3.1	9.0	

Appendix B Typical Cross-Sections





ALTERNATIVE 1B

3.Qn











Appendix C Construction Methods

ALTERNATIVE 1A















ALTERNATIVE 1B





















ALTERNATIVE 2A













ALTERNATIVE 2B



















ALTERNATIVE 3















































Appendix D

Conceptual Construction Staging Cross-Sections

















Appendix E Concepts at Municipal Drain Crossings





IAME:0:\DRIC\16_Structural\CADD\Turkey Creek Bridge\Sketch2~At 1E DATE:Feb 05, 2007 - 4:25pm



URS

DRIC-PRACTICAL ALTERNATIVES ALTERNATIVE "2A" - HIGHWAY 401 AT GRADE AT TURKEY CREEK, SOUTH OF HWY 3 (TALBOT ROAD/HURON CHURCH ROAD)







DRIC-PRACTICAL ALTERNATIVES ALTERNATIVE "2B-MODIFIED" - HWY 401 ABOVE TURKEY CREEK CULVERT, SOUTH OF HEY 3 (TALBOT ROAD AND HURON CHURCH ROAD)

METRIC DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

<mark>ፍ HWY 40</mark>1 EXISTING GROUND HWY 401 EB $\hat{\mathbf{U}}$ \hat{U} 仑 <u>SECTION "A-A"</u> 1:25 <u>EAST</u> TURKEY CREEK - EXISTING GROUND ----- H₩Y 401 1. 1. A. A. A. al an an an an an a - TEMPORARY SULKHEAD

EAST HALF WIDTH OF TURKEY CREEK CLOSED DURING STAGE HALF OF TURKEY CREEK CULVERT TO BE CONSTRUCTED IN STAGE 1

<u>SECTION "B-B"</u> 1:25

 $\overline{\mathbf{v}}$

17.00

SKETCH 5

<u>SOUTH</u>





Appendix F

Construction Duration and Resource Requirements

Basic Tunnel Civil Structural Works (Caisson Wall System) Schedule Estimation

Cycle time for a tunnel -half twin box 200 m modular length item 2-12

Second													1	nos of	i day	s										
1 Constant terms during fragments of the register of the registe	Stage #	Activity Items	Quantity	unit	Production rate/day	Duration days	Resources	Trades	10 20	30	40	50	60	70	80	90	100	11	0 1	20 1	130	140	150	160 1	70	180 190
is plack if a range for all range for is of range for all ra	1	Caisson-External&Mid Walls	400	m	6	66	6 rigs/shift	30 rigs	50																	
10 2 ad - Maif from Box or X wall only 200 n 3 6 do 3 nageom 16 model in the Second and		(whole 1 km range, first half of twin Box							completed																	
In the service is backed as the service is according to be calculated in the ser	1a	2 nd -half twin box ext wall only	200	m	3	66	3 rigs/shift	15rigs																		
1b pussion all scatters 2000 m 6 400 frageword		On & off ramps Box tunnels/ below grade																								
Image: Securation for Base Stable Distance Stable Distance Stable Distance Stable Distance Stable 3 Install Signer of struts and walter 600 m 302 10 Tools Stort worker Together 4 Base Stable Robance Pour 400 m 100 40 10 Tools Stort worker Together 5 Install Signer of struts and walter 400 m 100 40 10 Tools Tools Stort worker 6 restrutting 2 Bayers 400 m 100 40 10 Tools Stort worker Together 7 Interior scal walles to lift 400 m 100 40 10 Tools Stort worker Together 7 Interior scal walles to lift 400 m 100 40 10 Tools Stort worker Together 8 Rod Stable Scalefol and Formwork 400 m 100 40 10 Tools Stort worker Stort worker 9 Rod Stable Scalefol and Formwork 400 m 100 40 10 Tools Stort worker Stort worker 10 Curing and Waterproofing layer 400 m 100 40 10 Tools Stort worker Stort worker 11 Backfill and compact with A 12400 m 1000 m 100 40 10 Tools Tools worker Stort worker<	1b	transition @ 3 locations	2400	m	6	400	6 rigs/shift	6 rigs	to proceed	d concu	urrently	/		_												
20m long modular section 0 0 0 3 Install 3 layers of studies and only and the section of th	2	Excavation for Base Slab	(200m x2x2 x3) 55000	m3	1000	55	2 crew	Excavators	, L					•												
a Install 3 layers of struts and waters 600 m 30 20 1 creat Number of the struts and waters 600 m 100 440 1 creat Number of the struts and waters Numee of the s		200m long modular section					2 0.01																			
3 Initiation a logits of runs and waters 0.00, m 3.00, 20, 10 cm 4 Ress State RestarGonce, Pour 100, 41, 10 cm, 10, 44, 10 cm, 10		In stall Q laws as af structure and walland			20		1																			
4 Base Stab-RebarkSconc. Pour (20 base implicitancy) 4000 m2 100 440 10 ever (20 base implicitancy) 5 Interior seal wall-upper III 400 m 10 40 10 ever (20 base implicitancy) 6 re-struction (20 base implicitancy) 400 m 10 40 10 ever (20 base implicitancy) 7 Interior seal wall-upper III 400 m 10 40 10 ever (20 base implicitancy) 100 46 10 ever (20 base implicitancy) 10	3	install 3 layers of struts and walers	600	m	30	20	1 crew	Steel workers riggers																		
interior seal valuel-s tilt dot n 0 dot 1 occurs reservator 6 nestroting seal valuel-s tilt 400 m 10 40 1 occurs 7 interior seal valuel-s tilt 400 m 10 40 1 occurs 8 Roof Stab Redar & Conc. Pour 400 m2 100 44 1 occurs 9 Roof Stab Redar & Conc. Pour 400 m2 100 44 1 occurs 10 Guring and Waterproofing layer 400 m2 100 44 1 occurs 11 Backfill and compact 1440 m3 440 1 occurs Record Stab Redar & Conc. Pour 4400 m2 100 Conceptor Record Stab Redar & Conc. Pour 4400 m2 100 Conceptor Record Stab Redar & Conc. Pour 4400 m2 100 Conceptor Record Stab Redar & Conc. Pour 4400 m2 100 Conceptor Record Stab Redar & Conc. Pour 4400 m2 100 Conceptor Record Stab Redar & Conc. Pour Record Stab Redar & Conc. Pour Record Stab Redar & Conceptor Record Stab Redar & Conc. Pour	4	Base Slab-Rebar&Conc. Pour	4800	m2	100	48	1 crew	re-bar /labor																		
0 interformed and water level 10	5	(25m bay length/6days)	400		10	40	1 01014																			
6 n=strutting-2 layers 400 m 10 40 Crew Sive worker 7 Interfor sail will-upper lift 400 m 10 40 Crew re-ber / Moor 8 Roof Slab Scaffoid and Fornwork 400 m 10 40 Issue working 9 Roof Slab Scaffoid and Fornwork 400 m 100 45 Issue working 9 Roof Slab Scaffoid and Fornwork 400 m 100 45 Issue working 9 Roof Slab Scaffoid and Fornwork 400 m 100 46 Issue working 9 Roof Slab Scaffoid and Fornwork 400 m 00 0 Issue working 10 Curing and Waterproofing layer 400 m 70 Issue working days for 1 st cycle of 20m half twin box 11 Backfill and compact 1400 m3 480 30 Iterw Issue working days for 1 st cycle of 20m half twin box 12 Road Work/restoration 200 m 7 30 Iterw Iterw / 10 Iterw / 10 Iterw / 10 Iterw / 10 Ite	5		400	- 111	10	40	TCIEW	re-bar /labor											_	-						
7 Interior seal wall-upper lift 400 m 10 10 metrior seal wall-upper lift 400 m metrior seal wall-upper lift 400 metrior seal wall-upper lift 400 metrior seal wall-upper lift metrior seal wall-upper lift 400 metrior seal wall-upper lift metrior seal wall-upper lift metrior seal wall-upper lift 400 metrior seal wall-upper lift metrior seal wall-upper	6	re-strutting-2 layers	400	m	10	40	1 crew	Steel workers						-							_					
1 interformed was waitupped in 10	7	Interior and well upper lift	400		10	40	1000	riggers								_										
8 Roof Slab Scafoid and Formwork 4800 100 48 1sel-crew expenses 3 Roof Slab-Robar & Conc. Pour 4800 10 100 48 1sel-crew rebar / Robor 10 Curing and Waterproofing layer 4800 100 48 10 100 48 10 100 48 100 100 48 100 100 48 100 100 100 48 100 100 48 100 100 100 48 100 100 100 48 100 <td></td> <td></td> <td>400</td> <td></td> <td>10</td> <td>40</td> <td>TCIEW</td> <td>re-bar /labor</td> <td></td>			400		10	40	TCIEW	re-bar /labor																		
Image: state in the s	8	Roof Slab Scaffold and Formwork	4800	m2	100	48	1set-crew	carpenters																		
9 Roof Slab-Rebar & Conc. Pour 4800 m2 100 448 1 crew re-bar./kbor 10 Curring and Waterproofing layer 4800 m2 800 600 1 crew labor 11 Backfill and compact 14400 m3 480 300 1 crew Babor 12 Read Work/restoration 200 m 7 300 1 crew Excewators 12 Read Work/restoration 200 m 7 300 1 crew Excewators 20 Reference Calsson drilling rigs / day shift Design Propose to use calsson wall as permanent wall integrating with concrete wall 210 net working days for 1 st cycle of 200m half-twin box 10 hour day shift Design Design Propose to use calsson wall as permanent wall integrating with concrete wall 210 net working days for 1 st cycle of 200m half-twin box 10 hour day shift Design 0 Design Propose to use calsson wall as permanent wall integrating with concrete wall 210 net working days for 1 st cycle of 200m half-twin box 10 hour day shift Design 0 Comparison Estimation 200 200 200 200 <td></td> <td>(25m bay length/6days)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td>		(25m bay length/6days)						-																		
10 Curing and Waterproofing layer 480 m2 60 1 crew 11 Backfill and compact 1440 m3 480 30 1 crew 12 Read Work/restoration 200 m 7 30 1 crew Excerviors 12 Read Work/restoration 200 m 7 30 1 crew Excerviors 20 m 7 30 1 crew paving Paving Paving Schedule Allow the construction of the ramps concurrently with the box tunnel section construction within the 3 year (into a long on caison wall, by open cut method for shallow grade transition 210 net working days for 1 st cycle of 200m half twin box thus, those sections / 15 10 hour day shift Design Propose to use caisson wall as permanent wall integrating with concrete wall droft fm so and eaver level cut off. Thus omitting the use slab footing for the retaining wall. 51 crease 610 hour day shift 15 dillings for 6 femp-tunnels 0 0 Concrete Pour Estimation 24 years (into a long the sing can bounds and cast saving can be achieved 10 hour day shift being frage / day on thalf twin box the sing can bounds and cast saving can be achieved 10 hour day shift on the fam fom fom fom fam psection x 5 section x 1 section x 1 (long day fom fam and compsect CAISSON Paving t	9	Roof Slab-Rebar &Conc. Pour	4800	m2	100	48	1 crew	re-bar /labor																		
10 Curing and Waterproofing layer 4800 m2 80 60 1 crew hebor 11 Backfill and compact 14400 m3 460 30 1 crew Excavators 12 Road Work/restoration 200 m 7 30 1 crew Excavators 12 Road Work/restoration 200 m 7 30 1 crew Excavators 2 Road Work/restoration 200 m 7 30 1 crew Excavators 3 Schedulde Allow the construction of the rampc 50 concurrently with the bx tunnel section construction within the 3 year inform frame/750 working days 10																										_
11 Backfill and compact 14400 m3 480 30 1 crew 12 Road Work/restoration 200 m 7 30 1 crew 12 Road Work/restoration 200 m 7 30 1 crew Schedule Allow the construction of the ramps concurrently with the box tunnel section construction within the 3 year time frame(750 working days) 10 hour day shift 10 hour day shift Besign Propose to use calson wall, by open cut method for shallow grade transition 210 net working days for 1 st cycle of 200m half-twin box thus, 1000m(1 km) it need 5 X 200m section-crews 10 hour day shift Design Propose to use calson wall as permanent wall integrating with concrete wall as the rest of the shift with box to complete within 4.7 years, including all Civil /M&E works 30 (68 dinlings/c020m-section) + 35 sections ² /1 to box is dinling for the retaining wall. Design Propose to allow the calsson to a deeper toe level to achieve lateral resistance and water level cut off. Thus omitting the use slab footing for the retaining wall. 10 erew 10 hour day shift both win section. North & South bounds. 0 Concrete Pour Estimation 20 Tri-axet Trucks(20 ton) 10 location trips/day 10 Our al grade rad/works 3.4 years 3.4 years 3.4 years Stabs 24x25x1.5x2=1800m3/	10	Curing and Waterproofing layer	4800	m2	80	60	1 crew	labor																		
12 Road Work/restoration 200 m 7 30 1 crew Compactors 12 Road Work/restoration 200 m 7 30 1 crew Excervators 14 Road Work/restoration 200 m 7 30 1 crew Parking 15 Road Work/restoration 10 met 10 met 10 met 16 Allow the construction of the ramps concurrently with the box tunnel section construction within the 3 year time frame(750 working days) 210 net working days for 1 st cycle of 200m half-twin box thus, 1000m(1 km) it need 5 X 200m section-crews 10 hour day shift 17 Design Propose to use caisson wall as permanent wall integrating with concrete wall for the entire tunnel and ramp sections 210 net working days for 1 st cycle of 200m half-twin box thus, 1000m(1 km) it need 5 X 200m section-crews 210 (6H drill rigs/200m-section) X 5 sections/1 15 drill rigs/200m-section) X 5 sections/1 15 drill rigs for the 6km 2nd -half twin box thus, 1000m(1 km) it need 5 X 200m section-crews 210 (6H drill rigs/200m-section) X 5 sections/1 15 drill rigs/200m-section) X 5 sections/1 15 drill rigs for the 6km 2nd -half twin box 18 Design Propose to allow the caisson to a deeper too level to achieve lateral resistance and water level cut off. Thus omiting thus as slab bototing for the retaining wall. 70 crew /10 hour day shift for both twin section, North &South bounds. 20 Excewator CAT320 (B cons/1 half twin box too malfway and commislion) 1 year 20 truck-round trips/day<	11	Backfill and compact	14400	m3	480	30	1 crew	Excavators											_							
12 Road wontrrestoration 200 m 1 30 Interval Description 12 Road wontrrestoration 200 m 1 30 Interval paving 2 Schedule Allow the construction of the ramps concurrently with the box tunnel section construction within the 3 year time frame(750 working days) 30 paving 10 hour day shift for the analysis, 2.8 years for 1 st cycle of 200m half-twin box tune, 1000m(1 km) in need 5 X 200m section-crews 10 hour day shift 51 calson drilling rigs / day shift Det Design Propose to use calsson wall as permanent wall integrating with concrete wall for the entire tunnel and ramp sections 51 calson drilling rigs / day shift Det 30 (6f drill rigs for 6 film day 200m / a day shift 51 calson drilling rigs / day shift 51 calson drilling rigs / day shift 51 6 drill rigs for 6 film day 200m / a day shift 51 6 drill rigs for 6 film day 200m / a day shift 51 calson drilling rigs / day shift 51 6 drill rigs for 6 film day 200m / a day shift 51 calson drilling rigs / day shift 51 calson drilling rigs / day shift 51 10 6 drill rigs for 6 film day 200m / a day shift with with e day a day are rigs of the day are day are rigs of the day are day are rigs of th	40				7	20	1	Compactros																		
Schedule Allow the construction of the ramps concurrently with the box tunnel section construction within the 3 year time frame(750 working days) Method Assume 4 and reas below grade using no calson wall, by open cut method for shallow grade transition 210 net working days for 1 st cycle of 200m half-twin box thus, 1000m(1 km) it need 5 X 200m section-crews 10 hour day shift Design Propose to use calisson wall as permanent wall integrating with concrete wall for the entire tunnel and ramp sections 210 net working days for 1 st cycle of 200m half-twin box thus, 1000m(1 km) it need 5 X 200m section-crews 10 hour day shift Design Propose to use calisson to a deeper to level to achieve lateral resistance and water level cut off. Thus omitting the use stab footing for the retaining wall. 210 net working days for 1 st cycle of 200m half-twin box thus section. North & South bounds. 10 hour day shift 0 O To complete within 4.7 years, including all Civil /M&E works for 1 is wing construction priord for use staving can be achieved Front end loader for use of 1 calsson drilling rigs 30 Excavation Estimation to use staving can be achieved 0 0 0 Concrete Pour Estimation Stab 24x25x1.5x2=1800m3/day 92 truck-round trips/day 120 Excavation Estimates twin a day a shift the poursiday 292 truck-round trips/day Stab 100 truck-round trips/day 120 trucks/day 120 trucks/day	12	Road Work/restoration	200	m	/	30	1 crew	Excavators paving																		
Schedule Allow the construction of the ramps concurrently with the box tunnel section construction within the 3 year time frame(750 working days) Method Assume 4 mor less below grade using no calson wall, by open cut method for shallow grade transition 210 net working days for 1 st cycle of 200m half-twin box tunnel section correws Design Propose to use calsson wall as permanent wall integrating with concrete wall for the entire tunnel and ramp sections 210 net working days for 1 st cycle of 200m half-twin box tunnel section / x5 section /								purng																		
Schedule Andw the Construction of the range 750 working days) Method Assume 4m or less below grade using no caison wall, by open cut method for shallow grade transition 210 net working days for 1 st cycle of 200m half-twin box thus, 1000m(1 km) it need 5 X 200m section-crews 10 hour day shift Design Propose to use caisson wall as permanent wall integrating with concrete wall for the entire tunnel and ramp sections 210 net working days is 2, 2 years for ts 1 half 6 km 13 0 (6# dill rigs 200m-section) x 5 sections/1 Design Propose to use caisson to a deeper toe level to achieve lateral resistance and water level cut off. Thus omitting the use slab footing for the retaining wall. To complete within 4.7 years, including all Civil /M&E works. 10 for w/10 hour day shift for both twin section. North &South bounds. 0 0 0 Excavator CAT320 Front end loader 16 km 0 0 10 crew /10 hour day shift for both twin section. North &South bounds. 120 Tri-axle Trucks(20 ton) 120 truck-round trips/day 0 0 Concrete Pour Estimation Sabs 24x25x1.5x2=1800m3/day 92 truck-round trips/day 8 ab 0 0.3 year Af grade roadworks 3.4 years Sabs 24x25x1.5x2=1800m3/day 200 truck-round trips/day 6 round -trip/truck/ 1200 truck-round trips/day 0 0.3 year Testing and commissioning <td>Sabadula</td> <td>Allow the construction of the romage</td> <td>o nourrontly wit</td> <td>th the he</td> <td>v tunnal aaatia</td> <td>noonotru</td> <td>otion</td> <td></td>	Sabadula	Allow the construction of the romage	o nourrontly wit	th the he	v tunnal aaatia	noonotru	otion																			
Method Assume 4m or less below grade using no caison wall, by open cut method for shallow grade transition 210 net working days for 1 st cycle of 200 m half-twin box thus, 1000m(1 km) it need 5 X 200m section-crews 10 hour day shift 51 caisson drilling rigs /day shift 50 0 Design Propose to use caisson wall as permanent wall integrating with concrete wall for the entire tunnel and ramp sections 210 #stx s = 635 net working days 16 / 4 start start fixm 51 caisson drilling rigs /day shift 50 6 drill rigs /200m; section / x 5 sections // to caisson drilling rigs / day shift be dwn adver level cut of . Thus omitting the use stals footing for the retaining wall. To complete within 4.7 years, including all Civil /M&E works of 6 drill rigs /200m; section // x 5 sections // x 5 secons // x 5 sections // x 5 sections // x 5	Schedule	within the 3 year time frame(750 work	ing days)		x tunner sectio	on constru	cuon																			
grade transition 210 net working days for 1 st cycle of 200m half-twin box thus, 1000m(1 km) it need 5 X 200m section-crews thus, 1000m(1 km) it need 5 X 200m section-crews 10 hour day shift Design Propose to use caisson wall as permanent wall integrating with concrete wall for the entire tunnel and ramp sections 210 net working days is 0.3 years for the 2 nd half 6 km 51 caisson drilling rigs (day shift Det 30 (6# drill rigs/200m-section) X 5 sections/1 Design Propose to allow the caisson to a deeper toe level to achieve lateral resistance and water level cut off. Thus omitting the use slab footing for the retaining wall. To complete within 4.7 years, including all Civil /M&E works 5 d dill rigs for 6 ramp-tunnels 0 Space, time and cost saving can be achieved To extruction Schedule Estimation Basic tunnel and Ramp Structures and at grade roadworks 3.4 years M&E supply and installation 1 year Slabs 24x25x1.5x2=1800m3/day 200 truck-round trips/day 12 w ramp: 2k m3/d ramp 2k m3/day We supply and installation 1 year Target Total Required Time 4.7 years Reference Caisson production rate project records: DVP high mast light, 2001 1m dia 12.18 m deep 1#/rig/ day shift by Anchor Shoring Verail Total 2620m3/day 292 truck-round trips/day 6 round -trip/txck 120 trucks/day	Method	Assume 4m or less below grade using	g no caison wal	ll, by ope	en cut method i	for shallow	ı										_									
Design Propose to use caisson wall as permanent wall integrating with concrete wall for the entire tunnel and ramp sections Design Propose to allow the caisson to a deeper toe level to achieve lateral resistance and water level cut off. Thus omitting the use slab footing for the retaining wall. Space time and cost saving can be achieved Overall Construction Schedule Estimation Basic tunnel and Ramp Structures and at grade roadworks M& E supply and installation 1 year Target Total Required Time 4.7 years Reference Caisson production rate project records: DY high mast light, 2001 10 10 20 20 20 20 20 20 20 20 20 20 20 20 20		grade transition						210 net workin	g days for 1	st cycl	le of 20	0m hal	lf-twin t	хос				10	hour	r day s	shift	n drill	ina ric	e /day	, chif	t Dota
for the entire tunnel and ramp sections 635+210=845 working days is 3.4 years for the 2 nd half 6 km 15 drill rigs for the 6km 2nd -half twin box Design Propose to allow the caisson to a deeper toe level to achieve lateral resistance and water level cut off. Thus omitting the use slab footing for the retaining wall. To complete within 4.7 years, including all Civil /M&E works 6 drill rigs for the 6km 2nd -half twin box Space , time and cost saving can be achieved 10 crew /10 hour day shift for both twin section, North &South bounds. 120 Tri-axle Trucks(20 ton) (10 loads / 10 loads / 1	Design	Propose to use caisson wall as perma	anent wall integ	rating w	ith concrete wa	all		210+ 85x 5 =	635 net wor	kingday	s,ie 2.6 y	years fo	or 1st hal	lf 6km					51	30 (6	5# dri	Il rigs/2	200m-s	ection)	x 5 s	ections/1
Design Propose to allow the caisson to a deeper toe level to achieve lateral resistance and water level cut off .Thus omitting the use slab footing for the retaining wall. To complete within 4.7 years, including all Civil /M&E works 6 6 for full rigs for 6 ramp-tunnels Space ,time and cost saving can be achieved 0 10 crew /10 hour day shift for both twin section, North &South bounds. 30 Excavator CAT320 Front end loader (50 ton) 0 0 10 crew /10 hour day shift for both twin section, North &South bounds. 120 Tri-axle Trucks(20 ton) (10 loads / 120 0 0 Concrete Pour Estimation Basic tunnel and Ramp Structures and at grade roadworks 3.4 years M&E supply and installation 1 year Slabs 24x25x1.5x2=1800m3/day 200 truck-round trips/day Slab 10k m3/c 12k m3/c Testing and commissioning Target Total Required Time 4.7 years Reference Caisson production rate project records: DVP high mast light, 2001 1m 12-18 m deep 1#/rig/ day shift by Anchor Shoring 120 trucks/day	-	for the entire tunnel and ramp section	is	-				635+210=845 wo	rking days ie	3.4 year	s for the	2 nd h	alf 6 km							15 dr	rill rig	s for th	ie 6km	2nd -h	alf tw	rin box
Project of and water level cut off. Thus omitting the use slab footing for the retaining wall. for full swing construction priod 15 Cranes (50 ton) 0 10 crew /10 hour day shift for both twin section, North &South bounds. 15 Cranes (50 ton) (10 loads / 0 0 Concrete Pour Estimation 120 Tri-axle Trucks(20 ton) (10 loads / 0 0 Concrete Pour Estimation 51x 16= 820 m3/day 92 truck-round trips/day Slabs 0 Sais tunnel and Ramp Structures 3.4 years Slabs 24x25x1.5x2=1800m3/day 200 truck-round trips/day ramp: 2k m3/c M&E supply and installation 1 year Testing and commissioning 0.3 year 6 round -trip/truck 120 trucks/day 120 trucks/day 120 trucks/day Peak period Total 2620m3/day 292 truck-round trips/day 6 round -trip/truck 120 trucks/day 120 trucks/day 120 trucks/day 120 trucks/day 120 trucks/day 120 trucks/day 120 trucks/day 0.3 year 120 trucks/day 120 trucks/day 120 trucks/day 120 trucks/day 120 trucks/day 120 trucks/day 120 trucks/day <t< td=""><td>Design</td><td>Propose to allow the caisson to a dee</td><td>oper toe level to</td><td>achieve</td><td>lateral resista</td><td>100</td><td></td><td>To complete</td><td>within 4.7 y</td><td>/ears,ii drilling r</td><td>ncludir</td><td>ng all</td><td>Civil /N</td><td>/I&E w</td><td>orks</td><td></td><td></td><td></td><td>30</td><td>6 dr</td><td>ill rig</td><td>s for 6</td><td>ramp-t</td><td>unnels Fr</td><td>ont o</td><td>nd loader/</td></t<>	Design	Propose to allow the caisson to a dee	oper toe level to	achieve	lateral resista	100		To complete	within 4.7 y	/ears,ii drilling r	ncludir	ng all	Civil /N	/I&E w	orks				30	6 dr	ill rig	s for 6	ramp-t	unnels Fr	ont o	nd loader/
Space ,time and cost saving can be achieved 10 crew /10 hour day shift for both twin section, North &South bounds. 120 Tri-axle Trucks(20 ton) (10 loads / 0 0 Concrete Pour Estimation Basic tunnel and Ramp Structures 3.4 years and at grade roadworks 3.4 years M& E supply and installation 1 year Testing and commissioning 0.3 year Target Total Required Time 4.7 years Reference Caisson production rate project records: DVP high mast light, 2001 1m dia 12-18 m deep DVP high mast light, 2001 1m dia 12-18 m deep Main 11/2 11/2 Ternake Trucks(20 ton) 10 crew /10 hour day shift by Anchor Shoring	Doolgii	and water level cut off .Thus omitting	the use slab fo	oting for	the retaining v	vall.		for full swing co	nstruction per	riod	igo								15	Cr	ranes	,	1020	(5	50 ton)
0 Excavation Estimation Basic tunnel and Ramp Structures and at grade roadworks 3.4 years M& E supply and installation 1 year Testing and commissioning 0.3 year Target Total Required Time 4.7 years Reference Caisson production DVP high mast light, 2001 1m dia 12-18 m deep 1#/rig/ day shift by Anchor Shoring DVP high mast light, 2001 1m dia 12-18 m deep 1#/rig/ day shift by Anchor Shoring		Space ,time and cost saving can be a	chieved					10 crew /10 ho	our day shift	for both	n twin se	ection,	North &	South	bounds	S.		1	20	Tr	ri-axle	Truck	s(20 to	n)	(1	10 loads /t
Overall Construction Schedule Estimation base Basic tunnel and Ramp Structures 3.4 years and at grade roadworks 3.4 years M& E supply and installation 1 year Testing and commissioning 0.3 year Target Total Required Time 4.7 years Reference Caisson production rate project records: DVP high mast light, 2001 1m dia 12-18 m deep 1#/rig/ day shift by Anchor Shoring 1.2m-dia 9m deep 1#/rig/ tashift	0							Concrete Pou	ur Estimatio	on														Ex	cavati	on Estimati
Overall Construction Schedule Estimation Basic tunnel and Ramp Structures and at grade roadworks 3.4 years M& E supply and installation 1 year Testing and commissioning 0.3 year Target Total Required Time 4.7 years Reference Caisson production rate project records: DVP high mast light, 2001 1m dia 12-18 m deep 1#/rig/ day shift by Anchor Shoring Number of the model of the				1																				ba	se	
and at grade roadworks 3.4 years and at grade roadworks 3.4 years M& E supply and installation 1 year Testing and commissioning 0.3 year Target Total Required Time 4.7 years Reference Caisson production rate project records: DVP high mast light, 2001 1m dia 12-18 m deep 1#/rig/ day shift by Anchor Shoring N2. 9m deep 1#/right shift	Overall Co	Distruction Schedule Estimation						Caisson Wall			51x 1	16= 82	u m3/d	ay		92 tr	uck-ro	und t	irips/c	Jay				Sla	ab	10k m3/da
M& E supply and installation 1 year Testing and commissioning 0.3 year Target Total Required Time 4.7 years Reference Caisson production rate project records: DVP high mast light, 2001 1m dia 12-18 m deep 1#/rig/ day shift by Anchor Shoring 1.2m-dia 9m deep 1#/right shift		and at grade roadworks	3.4 years					Slabs			24x2	5x1.5x	2=180	0m3/d	ay	200	truck-r	ound	l trips	s/day				ra	mp	2k m3/da
Lesting and commissioning 0.3 year Target Total Required Time 4.7 years Reference Caisson production rate project records: DVP high mast light, 2001 1m dia 12-18 m deep 1#/rig/ day shift by Anchor Shoring Kennedy/Morningside 1.2m-dia 9m deep 1#/right shift		M& E supply and installation	1 year					roof,/ base cre	w@2 half tw	inbox z	zone, ie	e 4 pou	rs/day		-	.						_				12k m3/d
Reference Caisson production rate project records: 12-18 m deep 1#/rig/ day shift by Anchor Shoring DVP high mast light, 2001 1m dia 12-18 m deep 1#/rig/ day shift by Anchor Shoring Kennedy/Morningside 1.2m-dia 9m deep 1#/right shift		Lesting and commissioning	0.3 year					Peak	period	Tota	ai		2620r	n3/da	У	292 t 49 tr	truck- ucks/	roun dav	d trip	os/day	/ 6	i round	trip/tr נ	'uck/12	200 tr 20 tru	uck-roun Icks/dav
DVP high mast light, 20011m dia12-18 m deep1#/rig/ day shift by Anchor ShoringKennedy/Morningside1.2m-dia9m deep1#/night shift			jouro		Reference	Caisson p	roduction ra	ate project rec	ords:								2010/	<u></u> ,								.cno, uuy
Kennedy/Morningside 1.2m-dia 9m deep 1#/night shift					DVP high mast	light, 2001		1m dia	12-	18 m de	еер	1	#/rig/ d	lay shi	ft by A	ncho	r Shor	ing								
Singapore MRT Yishun Line 1986 1m dia 20-25m deep 1#/rig/day shift by GTM-Coignet/Trevi 960# in 10months, with no casing, usin					Singapore MRT	ngsiae ' Yishun Lin	e 1986	1.2m-dia 1m dia	9m 20-2	ueep 25m de	ep	1#	1#/rig	/day s	hift bv	GTM	-Coigi	net/T	revi		ç	∂60# in	10mon	ths, with	n no ca	asing, usin



Basic Tunnel Civil Structural Works(Diaphragm Wall System Alternative) Schedule Estimation

Cycle time for a tunnel -half twin box 200 m modular length item 2-12



230 240 400 day	230	220	210	200	

1000m by 5 crews

(500m3/day/equipment)

130 truck-trips/day

2 major pourslab/day

6 round-trip/truck/day

Prepared by: Eric So Rev. June 2006

Basic Civil Structural Works Depressed Road Alternative Schedule Estimation

Cycle time for a Depressed Road Full Section 400 m modular length item 2-12

																	nos of	days						
			1	Production	Duration																			
Stage #	Activity Items	Quantity	unit	rate/day	days	Resources	Trades	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
1	Caisson-External Walls	6000	m	18	335	15 rigs/shift	-	150m r		L														
	(whole 3 km range full section)	all 1.2 m dia						comple	eted															
	On & off ramps Box tunnels/																							
	below grade																							
1b	transition @ 3 locations	2400	m	7.2	335	6 rigs/shift	6 rigs	to proc	eed	concu	irrently	/												
		(200m x2x2 x3)												•										
2	Excavation for Base Slab	93600	m3	2000	50	2 crew	Excavators								2									
	400m,asume 6.5m deep average						-																	
	x 36 m excavated width						1																	
3	Road subbase laver/structure	400	m	25	16	1 crew	-										_							
		100			10	1 01011																		
4	Base Slab-Plain Conc.laying	400	m	25	16	1 crew	labor						_											
5	Interior seal walls-1 st lift	800	m	20	40	2 crew	re-bar /labor				-							-						
							-																	
6	Interior seal wall-upper lift	800	m	20	40	2 crew	re-bar /labor												-					
																					1			
7	Paving	400	m	200	2	1 crew	dozers																	
· ·		400		200	2	TOCW	navers																	
							parere																	
Schedule	Allow the construction of the ramps	concurrently w	vith the	Depressed Ro	ad constru	ction																		
	within the 3 year time frame(750 wor	king days)																						
Method	Assume 4m or less below grade usir	ng no caison wa	all, by o _l	pen cut metho	d for shalle	w						_					_	40.1						
	grade transition						135 net workin	g days fo	or 1 s	st cycl רו	e of 40	0m se	ection I	ength				10 r	nour d	ay shi	itt son dr		ian li	dov
Design	Propose to use caisson wall as perm	anont wall into	aratina	with concrete	wall		thus, 3000m(3	= 465 no	t need	a rkina	dave i	io 2 v	oare					30	0		זר ע Son ur ע א או	m_sec	tions t	to pr
Design	for the depressed road and ramp see	ctions	grating		wan		1001 00 X0.0-	- 405 116		ikiig	uays,i	16 Z y	cars						15	drill r	ias for	the 3k	m 1 s	st -h
							To complete	within 3	vea	rs.inc	luding	a all (Civil /N	1&E w	orks				6	drill r	ias for	6 ram	o struc	cture
Design	Propose to allow the caisson to a de	eper toe level to	o achiev	e lateral resis	tance		Propose to use	36 caiss	on dri	illing ri	igs	0						1(D	Exca	vator C	AT320		From
	and water level cut off .Thus omitting	g the use slab f	ooting f	or the retainin	g wall.		for full swing co	nstruction	n perio	bd								1(D	Crane	es			(50
	Space ,time and cost saving can be a	achieved					6 crew per	10 hou	r da	i y sh i	ift							50	D	Tri-a>	kle Tru	cks(20	ton)	
							Earth moving grade Road area	say 5 s:	5000r	m3ma	ax/day	@pe	eak pei say '	riod, ie 1500m	e <mark>500</mark> I 3/day	loads ie 1	s/day (50 loa	<mark>500 tr</mark> ds/day Tota	uck-ro / (150 al 650	und ti truck- truck	rips/da -trips/o c trips	ay) lay) /day	50 tru 15 tru	ucks ucks
							road grading tot	tal					say 4	0mx6l 240,0	kmx1n)00m3	n B								
Overall Co	Description Schedule Estimation Basic Depressed Road and Ramp Structures	2years					Concrete caisso	on volume			36 #/	day)	(14 m3	8/# =	550m	n3/da	ıу	60 tr	uck-tr	ips/da	ау			
	M& E, sump pump supply and installation Testing and commissioning Target Total Required Time	1 year 0.5 year 3.5 years				Reference	Caisson prod DVP high mast Kennedy/Morn Singapore MR	luction r t light ingside T Yishun	rate 2001 Line	proje 1986	ct reco 1m di 1.2m 1m di	o rds: ia -dia ia	12 to 9m d 20-2	18 m eep 5m dee	deep ep		1#/ri 1#/ri 1#/ri	g/ day g/nigh g/day	shift b t shift shift by	y Ancl / GTM	hor Sh I-Coigr	oring net/Tre	w stee w stee witho	el ca el ca ut ca



(Exact Material Quantity To Be determined in or	ost estimate				
			Estimated	Target	
Areas Activity Items	Quantity unit	Production rate/day	Duration days	months	Equipment
Typical Items For the Expressway					avaavata -
site clearance/top soil removal	L.S.			3	excavator
grading-cut and fill	L.S.			3	scraper
underground services	L.S.				excavator
subgrade compaction	L.S.			3	30 ton compactor
Catab Dasin			-		
Subdrain	10 500 m	400	0 27	15	
	10,000 m			1.5	truck
Granular A 300mm thk.	15,000 m-lane	250	0 60	3	dozer
					front-end loader
100 mm open grade Drainage Layer	15,000 m-lane	250	0 60	3	compactor
260 mm thk. Plain Conc Pavement	9,000 m-lane	400	0 23	1.5	paving machine
Shoulder Device	6.000	404	0 45		truck
4 X 3m wide		400	15	n 1	
Barrier Wall	4,500 m	300	0 15	5 1	crane
Noise Wall	3,000 m	60	0 50) 2	
			-		
Light pole(High Mast)	15 ea		2	2 2	
		+		┨	
		+			
		1		1	
Typical Items For the Services Road(optional)				
site clearance/top soil removal	L.S.			3	excavator
					dozer, backhoe
grading-cut and fill	L.S.			3	scraper
underground services	L.S.	+			excavator
	L.J.			2	
Catch Basin				1	
subdrain	6,000 m	400	0 15	5 1	
Granular B 500 mm thk	12,000 m-lane	200	0 60) 3	truck
	10.000	0.5	0		
Granular A 300mm thk.	12,000 m-lane	250	U 50	2	ront-end loader
Conc. Curb and Gutter	6.000 m	200	0 30) 15	compactor
	0,000 III	200	5 30	, 1.0	
150 mm thk. Hot Mix	12,000 m-lane	400	0 30	1.5	paving machine
Shoulder	3,000 m	400	0 75	5 4	
				<u> </u>	
Sidewalk	3,000 m	100	U 30	1.5	
Landscape Area	12 000 m2	600	0 20) 1	
	12,000 1112		20	· · · · ·	

BasicCivil Works(At Grade Road Alternative)

Schedule Estimation -Use range approach

Cycle time for a modular range of 1500m (1.5 km) (Exact Material Quantity To Be determined in cost estimate

					Estimated	Target	_	nos. of months
Areas	Activity Items	Quantity	unit	Production rate/day	Duration days	months	Equipment	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
								Use 4 crews for the entire 6km Service Roads in 21 months
	Light pole							1
	Underpass for the entire 6km range,	proceed in 2-3	km zon	es concurrent	у.			
	Caisson wall	6,400	m	28	3 230	11	I 14 Drill rigs/3km zone	
	2x(1600+1600x2/2)=6400m							
	Excavation	750,000	m3	3000	250	12	2 8 excavators	
	(1600+3200/2)x 6.5x 36		_				8 dozers/loaders	
	Seal Wall	6,400	m	40	160	6	3	
								_
	grading and road refer to the main road	a Schedule						_
			-			-		_
	Pood/Bridge Creesings	1(0.0 energy d energy (bridge	-
	and Crook Crossing	I.					2-3 crews, T crew /bridge	
	Caisson foundation						Drill rige	
							Dhii fiys	
	Foundation capping beam							-
	Piers							
	Bridge Beam Placing						crane	
							truck	
	Bridge Deck							
								-
	Bridge furniture							
	-							7
	Paving						paving machine	
				-	•			-
							Earth moving	underpass: 3000m3max/day @peak period, ie 300 loads/day (300 truck-trips/day)
								initial overall excavation/grading: 300 loads/day (300 truck-trips/day)
								road grading total say 40mx6kmx1m
								240,000m3
								underpass total 750,000m3
								overall total 1,000,000m3 approx.
							Concrete caisson volume	28#x14 m3/# =400 m3/day
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29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
_		-	-		-			-											-
0	truc truc	cks/ cks/	'day 'day	 	10 10	load load	ds/tr ds/tr	uck uck	/da /da	y y									