APPENDIX

ENGINEERING SERVICES

SEWER OPERATIONS

BUSINESS CASE ANALYSIS

Ready Mix and Precast Concrete Plant

Executive Summary

The City's ready mix and precast concrete plant is currently operating out of the Cambie Works Yard which is slated for closure in the next few years. Prior to investing in a new plant, a business case was required to justify the need for the City to be providing these products and services themselves. This report reviews the business case for both a small-batch concrete plant and a small-batch concrete plant with precast facilities. Both cases are favourable in that they provide savings to the City. It is, therefore, recommended that the City proceed with building a small-batch ready mix plant with precast facilities.

Introduction

In the next few years the Cambie Works yard will be closed. A new works yard is presently being built in the False Creek flats and many of the current functions at Cambie Yard will be relocated to the new yard or to other existing yards. Prior to investing in new facilities it is important to ensure, through a business case analysis, that it is advantageous for the City to continue providing services internally.

This document analyses the business case for relocating the ready mix and precast concrete operation. In moving the operation the opportunity exists to design a facility to produce a different variety of products than are now produced and thus add more value to the City.

This business case examines the economics of producing a larger volume of ready mix. This is a product that provides significant economies over private supply when required in small batches. Constraints with existing equipment have precluded an increase in production. For comparison, two options are analyzed:

1. A small-quantity ready mix concrete plant

2. A small-quantity ready mix concrete and precast plant.

This report provides brief explanations of the background information and assumptions made for each of the options, the costs associated with a new plant and the private sector alternative, as well as the results of the business case analysis. It should be noted at this time that a number of prices, costs and quantities were referenced from the report prepared by KPMG titled "Impacts of the Possible Closure of the City of Vancouver's Precast Plant" and have subsequently been marked with an asterisk (*).

Existing and Future Demands

The existing plant currently produces specialty precast products for various City branches, as well as smaller orders of ready mix supplies. It was determined from the KPMG report that production of ready mix concrete in small quantities was economically feasible and could benefit the City with cost savings. In addition, production of 1500 A dry mix, primarily used by Streets operations, was included in the business case. Furthermore, the KPMG report determined that some of the current precast products are not economical to produce as equivalent products can be purchased at lower private

sector prices. As a result, this business case focuses only on a selection of precast products that the new plant would continue to produce. The following sections outline these future demands in greater detail.

Ready Mix Supplies

The majority of ready mix supplies currently being produced for City operations were included in the business case. They consist of 1528 B, 2828 B and 2828 C concrete supplies purchased by Waterworks, Streets and Sewers Operations, respectively. The annual quantities of these mixes as shown in Table 1, were referenced directly from the KPMG report rather than being based on the calculated averages between 1996 and 1999. The KPMG report provides a detailed breakdown of the quantities ordered, which was required to calculate private sector ready mix costs.

In addition to these supplies, an additional 100 m^3 of 1528 B would be purchased by Waterworks operations if the City decided to operate a new concrete batch plant at the Kent works yard. Streets, Sewers and Waterworks Operations would also purchase a total of 3100 m^3 of 1500 A dry mix from the new batch plant. Thus, a total of 3,200 m^3 of ready mix concrete was included in the business case analysis over existing demands. The existing precast plant also produces ready mix concrete for Traffic Operations and the Parks Board, but as these volumes vary from year to year, they were not included in the business case.

The ready mix discussed in this report is all produced in small batches. These small loads are less economic for private suppliers to produce and consequently this leads to a high outside cost and delays for our crews when picking up this material. Crew delays have not been included in the business case.

Table 1: Ready Mix Supplies and Annual Quantities

	Mix Design	Annual Quantity (m^3)
Existing	1528 B	326.4*
	2828 B	349.5*
	2828 C	363.9*
Future	1500 A	3100.0
	1528 B	426.4
	2828 B	349.5
	2828 C	363.9

Precast Products

In order to be the most economical, the precast portion of the plant would continue to produce the products that the plant does the most business in (listed below). The average annual quantities of these products as shown in Table 2 were calculated based on annual volumes sold between 1996 and 1999. Of the current standard products currently being

produced, the exposed concrete products (tree panels, tree surrounds and litter shells) and specialty products such as lamppost stands were excluded from the business case. These products represent a small percentage of the plant's business and the number of units ordered fluctuates widely from year to year.

Table 2: Standard Precast Products and Annual Quantities

Precast Products	Average Annual Quantity
Core Business Products	
Permanent catchbasin stone	342
Manhole base	291
Temporary catchbasin stone (4 per CB)	667
Manhole lid 1050 mm	282
Manhole adjusting stone	383
Other Precast Products	
Traffic pier	1761
Waterworks base	1077

Primary Business Case: Small-Batch Ready Mix Concrete Plant

In order to meet existing and future demands for small batch ready mix concrete supplies, the first option investigates the costs involved for a new, City operated small-batch ready mix concrete plant. These costs can be broken up into capital costs, including the purchase of land and construction of facilities, and projected annual operating costs.

Capital Costs

The first scenario involves purchasing 8,300 ft^2 of land at the Kent Avenue Works Yard at $16.07 per square foot ($700,000 per acre). At an interest rate of 6.0%, and an amortization period of 20 years, the capitalized value of land for the concrete batch plant, including access spaces, amounts to $11,480. Facilities for the small-batch ready mix concrete plant would include 350 ft^2 for office, operation terminal, staff room and bathroom areas; 1,600 ft^2 for concrete mixer footprint; 6,350 ft^2 for staff and visitor parking spaces, yard access and loading areas. Costs are as indicated in Exhibit I.

Preliminary site development and construction costs were provided by a consultant. Thus, the 8,300 ft^2 footprint of the small-batch ready mix concrete plant would result in development and building costs of $416,540.

Building a new concrete batch plant facility would also involve the purchase of new automated equipment including key components such as a drum or horizontal shaft mixer, cement silo, aggregate bins, batchers or weigh belts, screw and pocket-belt conveyors, discharge chute and computerized controls ($154,422 US). A detailed

estimate by Mixer Systems, Inc. has been included in Appendix A. As the majority of concrete batching and mixing equipment is produced in the United States (US), the additional cost of freight ($10,000 US) must also be included. Assuming an additional 60% for US exchange on the concrete batch plant equipment and a 25% margin for taxes, installation and administration, an equipment allowance of $328,844 for the batch plant was allotted.

Aside from the equipment required to batch and mix concrete, computer access is required for daily activities. The $10,000 computer allowance includes the costs of hardware, Windows software and a SAP license.

With the addition of contingency (15%), engineering fees (3%), design fees, permits and development fees, and Goods and Service Tax (GST) of 3%, the total capitalized cost of all facilities is $69,713 based on an interest rate of 6.0% and an amortization period of 20 years.

It should be noted that additional funding of $78,000, currently allotted to replace existing plant equipment, is available to offset a portion of the project costs, which in turn will lower the facilities capital annuity amount to $62,806 (a reduction of $6,907). As a result, two financial accounts are presented in Exhibit I below. The $78,000 revenue is not included in the first table so that annual operating costs of a City run facility (without supplement) can be impartially compared to the private sector. The second table includes this funding providing an accurate account of the financing required to acquire the land and construct the facility.

Exhibit I: Capital Costs at Kent Works Yard

Table No 1 (for cost comparison purposes - not including $78,000 equipment replacement fund) :

Land	
Land cost per square foot (based on $700,000 per acre)	$16.07
Plant area	8,300 ft^2
Plant land cost	$133,381
Land capital annuity @ 6.0%	**$11,480**
Facilities (includes PST)	
Site preparation, onsite services, structural, mechanical and electrical construction	$278,900
General Conditions	$22,000
Construction Management	$24,000
	$324,900
Contingency @ 15%	$51,491
Design Fee	$28,000
	$404,391
Engineering Fee @ 3%	$12,149
	$416,540
Computer System	$10,000
Equipment Allowance	$328,844
Permits/Development Fees	$31,000
	$786,384
GST (3%)	$23,606
Total facilities capital cost	$809,990
Facilities capital annuity @ 6.0% (20 year amortization)	**$69,713**

Table No 2 (for financing purposes - including $78,000 equipment replacement fund) :

Land	
Plant land cost	$133,381
Land capital annuity @ 6.0%	**$11,480**
Facilities (includes PST)	
Facility Construction	$324,900
Contingency @ 15%	$51,491
Design Fee	$28,000
	$404,391
Engineering Fee @ 3%	$12,149
	$416,540
Computer System	$10,000
Equipment Allowance	$328,844
Equipment Replacement Fund[1]	($78,000)
Permits/Development Fees	$31,000
	$708,384
GST (3%)	$21,354
Total Facilities Capital Cost	$729,738
Facilities capital annuity @ 6.0% (20 year amortization)	**$62,806**

[1] Equipment replacement funding collected through equipment charge rates over a period of time and held in reserve for the replacement of existing equipment

The total cost to acquire the land and construct the facility is $863,119.

Annual Operating Costs

Once the ready mix concrete plant is constructed and commissioned, annual costs to operate the plant must be considered. These include plant and building operation and maintenance, labour, administration, foregone property taxes and materials, which are shown in Exhibit II. As noted previously, the values marked with an asterisk (*) were taken from the KPMG report.

Exhibit II: Projected Annual Operating Costs

Capital annuities (rate 6.0%)	
Land	$11,480
Construction (Exhibit I Table No 1)	$69,713
Operating costs	
Wages, salaries and benefits	$129,980
Truck and equipment rentals	$51,000
Building maintenance	$2,500
Building operation (incl. telephone)	$5,000
Administrative expenses	$10,000
Foregone property taxes	$3,200
Material costs	$381,738
Total Costs including materials (for concrete mixes)	$664,611

Labour costs were calculated for a reduced staff of a newly created working foreman and an equipment operator (Exhibit III). Regular hours were calculated as 250 days per year at 8 working hours per day. Hourly wages were taken from the current collective agreement between the City of Vancouver and the Canadian Union of Public Employees, Local No. 1004, with exception of the working foreman. As this is a new position, the GVRD will be required to review the responsibilities and duties of the position and assign a classification and rate to it. For the purposes of this report, the hourly wage for the working foreman was calculated by taking the average wage between a sub-foreman construction and a foreman III construction. The aforementioned foreman III salary was referenced from the current Collective Agreement between the City of Vancouver and the City of Vancouver Foremen's Association. In addition to salaries and wages, benefits must be paid out at a premium of 53.5% on top of the hourly wage, and thus were included in labour costs. It should be noted that although overtime was not factored into the business case, tremendous cost savings would be realized by opening the City-owned batch plant as opposed to requesting a private sector plant to open during off-hours.

Exhibit III: Labour Costs (not including overtime)

Job Description	Class Title	Regular Hours	Hourly Wage	Wage and Benefits	Labour Cost
Working Foreman	Working Foreman[1]	2000	$23.21	$35.63	$71,260
Concrete Mixer	Equipment Operator I	2000	$19.13	$29.36	$58,720
Total					**$129,980**

[1] new position; class wage is yet to be determined

Foregone property taxes at the Kent site were estimated as $17,000* per acre, and thus, the area occupied by the concrete batch plant would cost the City an additional $3,200 per year.

Finally, material costs were estimated as shown in Exhibit IV. All prices include 7.5% PST and 3% GST. It was determined that cost savings in the order of $60,000 could be

realized with the purchase of bulk cement. Since it was assumed that all aggregate supplies would be purchased from the new aggregate handling facility, an overhead charge of $2.50 per tonne for new materials (14 mm stone and concrete sand) were added to base prices to cover storage and handling.

With the addition of capital annuities calculated in the previous section of $11,811 for land and $69,382 for facilities, the total projected annual costs attributed to the ready mix concrete plant is $664,611.

Exhibit IV: Material Costs for Precast Products and Ready Mix Supplies

Material[1]	Annual Consumption	Price $/ft or $/tonne	Annual Material Cost
Ready Mix Supplies			
cement - CSA 10	1614.6	$144.75	$233,713
aggregate - 20-mm Stone	5125.4	$17.48	$89,592
aggregate - 14-mm Stone	775	$22.69	$17,585
aggregate - concrete sand	2419.9	$16.88	$40,848
Total			$381,738

Private Sector Alternative

Without a new, City-owned and operated, small-batch ready mix concrete plant, the ready mix supplies that have been included as part of this business case will have to be supplied by the private sector. The following sections outline the conditions that would be required and the assumptions that were made such that the City's needs would be met at the lowest private sector cost alternative.

Ready Mix Supplies

Since the City currently relies on the private sector for larger orders of ready mix concrete, tendered contracts have already been set-up between the City and various suppliers. The prices per cubic meter of concrete for the mixes specific to this business case are as stated in Table 3. These prices are for 2000, and include applicable taxes and an environmental fee of $2.00/$m^3$. The price for Ocean is for supply of concrete only (pick-up by City crews), whereas the prices for Lafarge are for pick-up by City crews and delivery to City job sites, respectively. A minimum pick-up order of 0.8 m^3 applies for both suppliers and a minimum delivery order of 6 m^3 applies for Lafarge. Any orders less than 6 m^3 are subject to the additional charges as outlined in Table 4. It should be noted that the private sector prices for ready mix concrete do not include overtime costs or costs incurred for time spent waiting for concrete orders or making additional trips to pick-up concrete.

Table 3: Private Sector Price Comparisons for Ready Mix Concrete

Mix Design	Private Sector Price (per m^3)		
	Ocean (pick-up)	Lafarge (pick-up)	Lafarge (delivery)
1500 A	$114.40	$115.50	$114.24
1528 B	$91.30	$92.40	$91.83
2828 B	$100.10	$102.30	$101.43
2828 C	$101.20	$102.85	$101.97

Table 4: Additional Charges for Less than Minimum Loads (delivery only)

Load size	Additional charge per load (incl. taxes)
0.1 to 1	$99
1.1 to 2	$99
2.1 to 3	$88
3.1 to 4	$77
4.1 to 5	$66
5.1 to 6	$55

Due to the minimum load requirement of 0.8 m^3, the private sector cost for ready mix concrete had to be determined separately for supplies greater than or equal to 0.8 m^3 ($433,992) and supplies less than 0.8 m^3 ($249,691). The following sections deal with these cost derivations.

Concrete Supplies Greater than or Equal to 0.8 m^3

For concrete supplies greater than or equal to 0.8 m^3, the average private cost is as determined in Exhibit V. Since Ocean and Lafarge are the two suppliers for larger ready mix orders, and concrete is purchased from either supplier depending on the proximity of the plant to the construction site, average prices of the two suppliers were used to calculate costs. It should also be noted that since Sewers Operations require 2828 C concrete to be supplied in buckets, picking up concrete from either of the two plants is not feasible. This is because concrete is gravity discharged through a minimum clearance of 10 feet, and therefore, loading buckets would be difficult. Thus, an additional charge for delivery of $15,048 applies for these orders. This additional delivery charge was calculated using the approximate distribution of orders as determined in the KPMG report (67 orders were either 0.8 or 0.9 m^3, and 85 orders were greater than 1.0 m^3)*. With this additional charge, the total private cost of ready mix orders greater than or equal to 0.8 m^3 is $433,992.

Exhibit V: Total Cost of Ready Mix Orders Greater than or Equal to 0.8m^3

Mix Design	Annual Quantity	Average Unit Price ($/m^3)	Average Private Cost
1500 A	3100.0	$114.71	$355,606
1528 B	358.8	$91.84	$32,952
2828 B	119.1*	$101.28	$12,062
2828 C	179.7*	$101.97	$18,324
Subtotal	3757.6		$418,944
Extra charges for delivery of 2828 C			$15,048
Total			**$433,992**

Concrete Supplies Less than 0.8 m^3

Three alternatives were analysed in the supply of concrete orders less than 0.8 m^3. These included picking up a minimum of 0.8 m^3 of concrete per order, estimating the amount needed and disposing of the excess; paying the additional delivery charges to have these concrete supplies delivered to the job site with no guarantees that the concrete will be delivered when requested (total cost of $258,906); and renting concrete mixers and mixing these orders on-site. It was determined that the on-site mixing alternative was not only the most feasible, but also yielded the lowest projected cost of $252,479(Exhibit VI).

Exhibit VI: On-site Mixing Costs

Mixer rental	$77,321
Material cost	$55,391
Labour cost	$97,950
Truck cost	$ 8097
Backhoe cost	$13,720
Total cost	**$252,479**

Mixer rental costs were calculated assuming that nine 9-ft^3 (0.25-m^3) mixers would be rented for the full year at a City rental rate of $17.14 /day. In addition, 7.5% PST, 3% GST and a 20% surcharge for gas, maintenance, insurance and administration were added to the total. These mixers would be allocated in the following manner depending on the number of orders specified for each operation (Table 5): Waterworks – 1, Streets– 4, Sewers – 4.

Table 5: Concrete Supplies Less than 0.8 m^3

Mix Design	Annual Quantity	Orders
1528 B	67.6	194
2828 B	230.4	577
2828 C	184.2	535
Total	482.2	1306

Material costs were broken down into cement and aggregate costs. The cost of cement was calculated using the total number of cement sacks required for all orders as shown in Exhibit VII. The assumption was made that a partially used sack of cement would be disposed of at the job site and not recovered for use in a subsequent order. The total cost of cement would be $37,418 assuming the continued purchase of 40-kg sacks from Tilbury Cement at $6.36 per sack. In addition to raw cement costs, 7.5% PST, 3% GST and a 25% overhead for storage and handling at existing Central Stores were added to the total. Assuming that 20-mm stone would be purchased from the new aggregate handling facility at $17.48 per tonne, the total cost of aggregate would be $17,973. The price per tonne of 20-mm stone includes 7.5% PST and 3% GST. To allow for inaccuracies of small order pick-ups at the new aggregate facility, the amount of aggregate purchased was increased by 20%.

Exhibit VII: Total Number of Cement Sacks Required for On-site Mixing

	1528 B (Water)		2828 B (Streets)		2828 C (Sewers)		
Order size (m^3)	Sacks per Order size	Orders (Actual)	Sacks per Order size	Orders (Actual)	Sacks per Order size	Orders (Actual)	Total Sacks Required
0.1	1	4	1	36	1	20	60
0.2	1	44	2	127	2	137	572
0.3	2	35	3	69	3	67	478
0.4	2	92	4	103	4	251	1,600
0.5	3	3	4	97	5	27	532
0.6	3	16	5	105	6	23	711
0.7	4		6	40	7	10	310
		194		577		535	4,263

Labour costs were calculated based on an average cost of a 5-person crew ($150/hour) working 0.5 hours per order. Truck and backhoe costs for the 0.5 hours spent loading and unloading the mixer and mixing the concrete were also added to the total cost of on-site mixing. The costs of a single truck and backhoe also help account for travel costs incurred picking up materials and transporting the mixer to and from job sites, respectively. It was approximated that based on 2000 hours of use per year, a single truck costs $9.50/hour, in addition to $0.95/hour for insurance and $1.95/hour for fuel, and a backhoe costs $19.95/hour, in addition to $0.16/hour and $0.90/hour for insurance and fuel, respectively.

Primary Business Case: Conclusion

Cost savings will be realized should the City construct a new ready mix concrete batch plant for small batches. It is noted that the yearly operating costs for a City run small Batching Plant would be $664,611 per year. The same supply ordered from the private sector would have a total cost to the City of $686,471. The difference in cost is $21,860 which the City would save annually.

Secondary Business Case: City run small-batch Ready Mix and Precast Concrete Plant

In order to meet existing and future demands for precast products and ready mix supplies, this additional option investigates the costs involved for a new, City-operated, precast and ready mix concrete batch plant. These costs can be broken up into capital costs, including the purchase of land and construction of facilities, and projected annual operating costs.

Capital Costs

This scenario involves purchasing 24,829 ft^2 of land at the Kent Avenue Works Yard at $16.07 per square foot ($700,000 per acre). At an interest rate of 6.0%, the capitalized value of land for the concrete batch plant, including access spaces, amounts to $34,340. Facilities for the batch plant would include 450 ft^2 for office, staff room and bathroom areas; 4475 ft^2 for precast workshop area; 600ft^2 below mezzanine floor for covered storage area; 600 ft^2 for staff and visitor parking spaces; and 19,529 ft^2 for yard storage and access spaces. Costs are as indicated in Exhibit XI.

Preliminary site development and construction costs were provided by a consultant. Thus, the 24,829 ft^2 footprint of the concrete batch plant would result in a site development and building cost of $953,271.

Building a new concrete batch plant facility would also involve the purchase of new, automated, equipment including key components such as a drum or horizontal shaft mixer, cement silo, aggregate bins, batchers or weigh belts, screw and pocket-belt conveyors, discharge chute and computerized controls ($154,422 US). A detailed estimate by Mixer Systems, Inc. is attached to the report. As the majority of concrete batching and mixing equipment is produced in the United States (US), the additional cost of freight ($10,000 US) must also be included. In addition to the batching and mixing equipment, an allowance of $15,940 was included to cover the purchase and installation of two overhead crane systems. Assuming an additional 60% for US exchange on the concrete batch plant equipment and a 25% margin for taxes, installation and administration, an equipment allowance of $328,844 for the batch plant was allotted. Thus, a total of $348,769 was allotted for equipment for the new plant.

Aside from the equipment required to batch and mix concrete, computer access is required for daily activities. The $10,000 computer allowance includes the costs of hardware, Windows software and a SAP license.

With the addition of contingency (15%), engineering fees (3%), design fees, permits and development fees, and Goods and Service Tax (GST) of 3%, the total capitalized cost of all facilities is $119,069 based on an interest rate of 6.0% and an amortization period of 20 years.

As stated in the previous proposal, additional funding of $78,000, currently allotted to replace existing plant equipment, is available to offset a portion of the project costs, which in turn, will lower the facilities capital annuity amount to $112,162 (a reduction of $6,907). As a result, two financial accounts are presented in Exhibit XI, on the following page. The $78,000 revenue is not included in the first table so that annual operating costs of a City run facility (without supplement) can be impartially compared to the private sector. The second table includes this funding providing an accurate account of the financing required to acquire the land and construct the facility.

Exhibit XI: Capital Costs at Kent Works Yard

Table No 1 (for cost comparison purposes - not including $78,000 equipment replacement fund) :

Land	
Land cost per square foot (based on $700,000 per acre)	$16.07
Precast and plant area	24,829 ft^2
Precast and plant land cost	$399,000
Land capital annuity @ 6.0%	**$34,340**
Facilities (includes PST)	
Site preparation, onsite services, structural, mechanical and electrical construction	$655,854
General Conditions	$44,468
Construction Management	$48,026
	$748,348
Contingency @ 15%	$121,452
Design Fee	$55,585
	$925,385
Engineering Fee @ 3%	$27,886
	$953,271
Computer System	$10,000
Equipment allowance	$348,769
Permits/Development Fees	$31,000
	$1,343,040
GST (3%)	$40,403
Total facilities capital cost	$1,383,443
Facilities capital annuity @ 6.0% (20 year amortization)	**$119,069**

Table No 2 (for financing purposes - including $78,000 equipment replacement fund) :

Land	
Precast and plant land cost	$399,000
Land capital annuity @ 6.0%	**$34,340**
Facilities (includes PST)	
Facility Construction	$748,348
Contingency @15%	$121,452
Design Fee	$55,585
	$925,385
Engineering Fee @ 3%	$27,886
	$953,271
Computer System	$10,000
Equipment Allowance	$348,769
Equipment Replacement Fund[1]	($78,000)
Permits/Development Fees	$31,000
	$1,265,040
GST (3%)	$40,033
Total facilities capital cost	$1,305,073
Facilities capital annuity @ 6.0% (20 year amortization)	**$112,162**

[1] Equipment replacement funding collected through equipment charge rates over a period of time and held in reserve for the replacement of existing equipment

The total cost to acquire the land and construct the facility is $1,704,073.

Annual Operating Costs

Once the concrete batch plant is constructed and commissioned, annual costs to operate the plant must be considered. These include plant and building operation and maintenance, labour, administration, interest on inventory, foregone property taxes and materials, as shown in Exhibit XII. As noted previously, the values marked with an asterisk (*) were taken from the KPMG report.

Exhibit XII: Projected Annual Operating Costs

Capital annuities (rate 6.0%)	
Land	$34,340
Construction (Exhibit XI Table No 1)	$119,069
Operating costs	
Wages, salaries and benefits	$250,340
Truck and equipment rentals	$62,000
Building maintenance	$12,500
Building operation (incl. telephone)	$34,500
Administrative expenses	$20,000
Interest on inventory	$4,000
Foregone property taxes	$9,655
Material costs	$426,136
Total Costs including materials (for concrete mixes)	**$972,540**

Labour costs were calculated for a reduced staff of a working foreman, concrete mixer, concrete finisher and forklift operator, warranted by the increased efficiency of a new batch plant (Exhibit XIII). Regular hours were calculated as 250 days per year at 8 working hours per day. Hourly wages were taken from the current collective agreement between the City of Vancouver and the Canadian Union of Public Employees, Local No. 1004, with exception of the working foreman. As this is a new position, the GVRD will be required to review the responsibilities and duties of the position and assign a classification and rate to it. For the purposes of this report, the hourly wage for the working foreman was calculated by taking the average wage between a sub-foreman construction and a foreman III construction. The aforementioned foreman III salary was referenced from the current Collective Agreement between the City of Vancouver and the City of Vancouver Foremen's Association. In addition to salaries and wages, benefits must be paid out at a premium of 53.5% on top of the hourly wage, and thus were included in labour costs. It should be noted that although overtime was not factored into the business case, tremendous cost savings would be realized by opening the City-owned batch plant as opposed to requesting a private sector plant to open during off-hours.

Exhibit XIII: Labour Costs (not including overtime)

Job Description	Class Title	Regular Hours	Hourly Wage	Wage and Benefits	Labour Cost
Working Foreman	Working Foreman	2000	$23.21	$35.63	$71,260
Concrete Mixer	Equipment Operator I	2000	$19.13	$29.36	$58,720
Concrete Finisher	Concrete Finisher (Constr.)	2000	$19.60	$30.09	$60,180
Forklift Operator	Equipment Operator II	2000	$19.60	$30.09	$60,180
Total					$250,340

Truck and equipment rentals include the approximate costs of a forklift ($11,000) and pick-up truck ($11,000), including insurance and fuel based on 2000 hours /year, as

well as a sinking fund allowance ($40,000) to help cover the cost of replacing the concrete batch plant in 20 years. Foregone property taxes at the Kent site were estimated as $17,000* per acre, and thus, the area occupied by the concrete batch plant would cost the City an additional $9,655 per year.

Finally, material costs were estimated as shown in Exhibit XIV. All prices include 7.5% PST and 3% GST. It was determined that cost savings in the order of $60,000 could be realized with the purchase of bulk cement. Since it was assumed that all aggregate supplies would be purchased from the new aggregate handling facility, an overhead charge of $2.50 per tonne for new materials (14 mm stone and concrete sand) were added to base prices to cover storage and handling.

With the addition of capital annuities calculated in the previous section of $34,340 for land and $119,069 for facilities, the total projected annual costs attributed to the concrete plant totals $972,540.

Exhibit XIV: Material Costs for Precast Products and Ready Mix Supplies

Material[1]	Annual Consumption	Price $/ft or $/tonne	Annual Material Cost
Precast Products			
10-mm rebar (ft)	40,000	$0.19	$7,600
4x2 wire welded mesh (ft)	100	$1.81	$181
½" & 3/4" PVC tubing (ft)	2,000	$0.15	$300
7-strand galvanized guy wire (ft)	7,000	$0.32	$2,240
cement - CSA[2] 10	147.6	$144.74	$21,364
aggregate - 20-mm Stone	728.7	$17.48	$12,737
Subtotal			$44,422
Ready Mix Supplies			
cement - CSA 10	1614.6	$144.74	$233,697
aggregate - 20-mm Stone	5125.4	$17.48	$89,592
aggregate - 14-mm Stone	775	$22.68	$17,577
aggregate - concrete sand	2419.9	$16.88	$40,848
Subtotal			$381,714
Total			**$426,136**

[1] Unless otherwise specified, material measured in tonnes.

[2] Canadian Standards Association

Private Sector Alternative for Precast Products

In order to obtain the lowest private sector cost alternative for precast products, a study was conducted by KPMG, in which various suppliers were consulted for unit prices of the standard precast product line, as well as alternatives to these products. Sewer Design and Operations staff reviewed the suggested private sector alternatives to City-made precast products and did not consider them to be suitable alternatives. Therefore, the private sector prices to reproduce the City-designed products were used. While it may be reasonable to take into account inaccuracies in non-tender prices and calculate costs using the average unit prices of all suppliers, the lowest cost supplier for each product was used in this report.

It should be noted that an equivalent product for the manhole adjusting stone is not produced by the private sector. Comparing the dimensions of the City's product and that of a supplier, it was determined that the City's manhole adjusting stone is 44% larger than that of the supplier's. Thus, to compensate for this discrepancy, the average unit price as determined by KPMG was increased by 44%. In addition, the unit prices were adjusted by 3% per year to reflect 2000 rates. All prices include applicable taxes and an additional 25% overhead was included for storage and handling at existing Central Stores. Taking all these factors into consideration, the total private cost for precast products is $382,034.

Exhibit XV: Average Private Sector Prices and Total Cost for Precast Products in 2000

Precast Products	Average Annual Quantity	KPMG Lowest Unit Price*	Revised Lowest Unit Price	Private Cost
Core Business Products				
Permanent CB stone	342	$238.38	$316.12	$108,113
Temporary CB stone	667	$69.09	$91.62	$61,111
Manhole base	291	$192.02	$254.64	$74,100
Manhole lid 1050 mm	282	$99.00	$131.28	$37,021
Manhole adjusting stone	383	$54.93	$104.90	$40,175
Subtotal				$320,520
Other Precast Products				
Traffic pier	1761	$15.30	$20.29	$35,731
Waterworks base	1077	$18.05	$23.94	$28,783
Subtotal				$61,514
Total				**$382,034**

Secondary Business Case: Conclusion

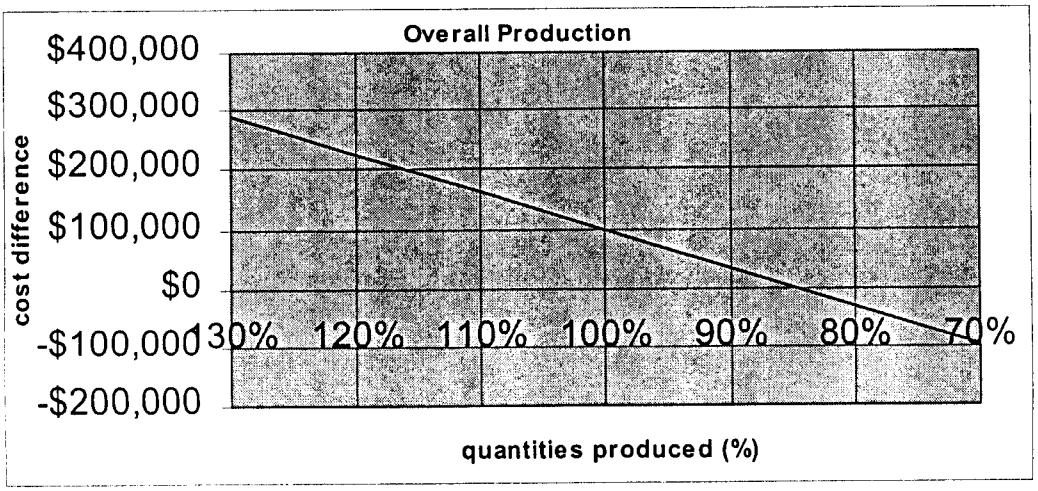
This option involves building a complete precast concrete and ready mix plant. The annual operating cost for this facility would be $972,540. The alternative option would be to purchase both precast concrete items and ready mix concrete from private suppliers. This option would attract a yearly cost of $1,068,505 and would therefore cost the City an additional $95,965 per year. It should be noted that the cost to purchase product from private suppliers is based on 2000 pricing and that subsequent years would be affected by the private sector pricing structures.

Sensitivities

From year to year, operating costs and offsetting revenues are effected by product demand. Plant operations costs resulting from decreasing demands and costs of purchasing comparable quantities from the private sector are compared in this section. Only the secondary proposal is being reviewed in this analysis as this option will bring the most benefit to the City.

Producing less product will lower the overall operating cost of a City run plant. Reductions in costs are primarily effected by the purchase of fewer quantities of raw materials. Other reductions, such as building maintenance and administrative costs, are negligible and therefore have not been included. Lower demands will also reduce the cost incurred by the City if purchasing product from the private sector.

The following graph illustrates cost differences between producing product at a City run facility and purchasing the same quantity of product from the private sector, as product demand varies. The material cost component of the City run operation and the quantities purchased from the private sector have been adjusted proportionate to fluctuating demand, reflecting the costs associated with producing varying quantities of ready mix and precast concrete products. The cost difference between the two options is plotted against different quantities, expressed as a percentage of the quantities discussed in the report (100% represents the quantities discussed in the report).

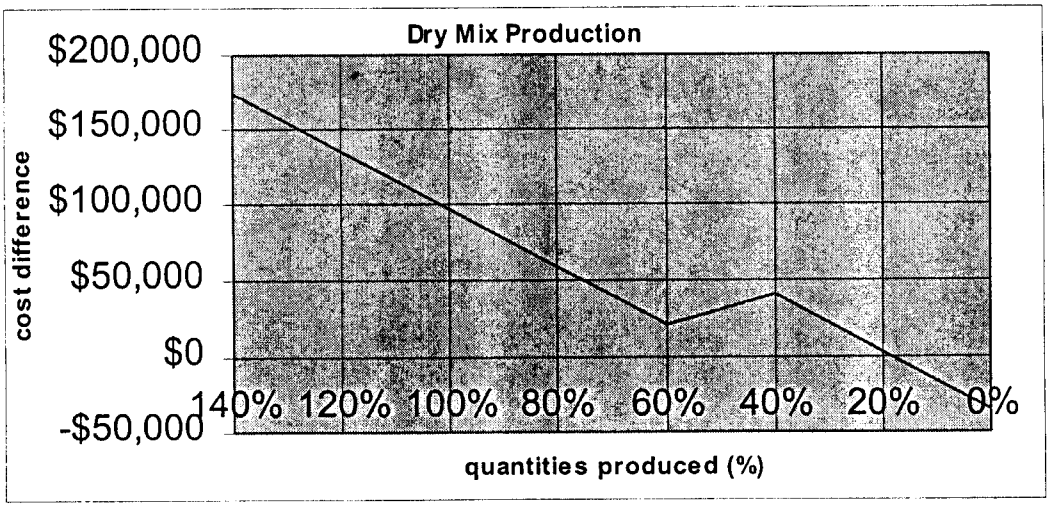


It is determined from the above graph that an overall decrease in production of 16% would precipitate a cost neutral situation resulting in no savings to the City. Therefore, it would be beneficial to the City to purchase product from the private sector should production decline beyond 16% of the current volumes. Conversely, additional savings would result from operating a City run plant should productivity increase in the future.

Furthermore, the business case is based on the new facility supplying an additional 3100 m^3 of dry mix concrete to the amounts currently produced. This stems from the new plant being capable of producing small batches of dry mix concrete whereas the existing plant is not capable of providing this product.

Streets, Waterworks and Sewers annual capital works programs are well established and ongoing, with requirements for ready mix concrete being relatively consistent between years. While it is expected that these quantities will be required in the future and the Branches have committed to the purchase of these additional amounts from the newly constructed plant, it would be prudent to consider the impact on the plant should these anticipated quantities fluctuate in the future.

The following illustrates cost differences between producing varying quantities of dry mix concrete at a City run facility and purchasing the same amount of product from the private sector. Similar to the previous analysis, material costs for dry mix concrete produced by the City and quantities purchased from the private sector have been adjusted proportionate to fluctuating demand, reflecting the costs associated with producing varying quantities of dry mix concrete. The cost difference between the two options is plotted against different amounts, expressed as a percentage of the quantities discussed in the report (100% represents the quantities discussed in the report).



It is determined from the above graph that an 81% decrease in production of dry mix concrete would precipitate a cost neutral situation resulting in no savings to the City. Therefore, it would be beneficial to the City to purchase product from the private

sector should production decline beyond 81% of the anticipated volumes. Conversely, additional savings would result from operating a City run plant should the requirement for dry mix concrete increase in the future. It is noted however, that a reduction in quantities between 40% and 60% of the volumes currently anticipated, would result in a reduction in labour requirements at the facility amounting to 1 fte should the expected demand fall by 60%.

Summary

The total costs for both options analysed within this business case are summarized in Exhibit XVI. By comparing the costs found in the primary proposal , it is clear that the City will save an estimated $21,860 per year by producing its own ready mix concrete supplies. It is also apparent, by way of the second option, that the City would save $95,965 per year by operating a City-owned precast and ready mix concrete plant. These savings are conditional on the quantities indicated in the report and would be negated should product demand decline by 16%. It should be noted that the additional factor of convenience, although not quantified within this business case, would also add to the attractiveness of these two City alternatives.

Exhibit XVI

Proposal: City run small-batch Ready Mix Facility

Option 1: Total Annual Operating Cost (City)	***$664,611***
Option 2: Private Sector Cost (No City Run Ready Mix Facility)	
Batches >= 0.8 cu m	$433,992
Batches < 0.8 cu m	$252,479
	$686,471
Difference	**($21,860)**

Additional Proposal: City run small-batch Ready Mix & Precast Facility

Option 1: Total Annual Operating Cost (City)	***$972,540***
Option 2: Private Sector Cost (No City Run Readymix/Precast Facility)	
Precast Products	$382,034
Ready Mix >= 0.8 cu m	$433,992
Ready Mix < 0.8 cu m	$252,479
	$1,068,505
Difference	**($95,965)**

Appendix A

QUOTATION

Mixer Systems, Inc.®
190 Simmons Avenue
Pewaukee, WI 53072
Telephone (414) 691-3100
FAX (414) 691-3184

ECONO BATCH
6335-01

TO: City of Vancouver
453 W 12th Ave
Vancouver British Columbia
V5Y 1V4

QUOTATION NUMBER: 8-22-01
DATE: _____ VALIDITY: 90 Days

TERMS: Delivery F.O.B. Carrier, Factory
Payable in U.S. Funds
25% DEPOSIT WITH ORDER
75% BEFORE FINAL SHIPMENT

Frank Crudo

CUSTOMER INQUIRY: _____
AFTER RECEIPT OF ORDER
AND APPROVAL DRAWINGS: 10-14 Weeks

MODEL 54 MIXER SYSTEMS/PRASCHAK PADDLE MIXER
- 54 cu. ft. capacity
- 50 hp, 230/460 v, 3 ph, 60 hz, 1800 RPM, TEFC electric motor
- Replaceable ni-hard drum liners
- Replaceable AR steel side liners and side wiper blades
- Secondary seals on main shaft (grease chamber type)
- Pneumatic operated discharge door with heavy duty urethane seal and hand lever control valve
- Air line lubricator, moisture trap and pressure regulator.
- Water distribution - rectangular tubing w/round holes for water discharge
- 16'-6" mixer stand

MIXER CLEAN OUT PLATFORM
One mixer clean out platform welded to the mixer stand. The platform is complete with handrails, toe boards, open type grating and ladder.

COMBINATION CEMENT AND WATER WEIGH BATCHER
One 21 cu. ft. capacity cement weigh batcher with two pneumatically operated butterfly cement discharge gates with single solenoid valve and limit switch. Cement weigh batcher is mounted above mixer and connected to mixer with canvas sock connection.

One 80 gallon capacity water weigh batcher with 1 ½" electric operated single solenoid water inlet valve and 3" pneumatically operated butterfly water discharge valve with single solenoid valve and limit switch. Water weigh batcher is mounted above mixer and connected to mixer with flexible hose connection.

This combination weigh batcher is suspended by load cells for accurate weighing of cement and water.

AGGREGATE BIN 1 REQUIRED
21 ton (418.2 cu. ft.) capacity single compartment aggregate bin. (CPMB rated at 100 lbs. per cu. ft. water level) Aggregate bin is equipped with a pneumatically operated double clamshell discharge gate complete with air cylinder, single solenoid valve and adjustable gate stop. The aggregate bin is suspended by load cells for accurate decumulative weighing of materials. One air line filter with moisture trap and one air line regulator is provided for use with one to six bins. Each bin is provided with one air line lubricator.

AGGREGATE BIN 1 REQUIRED
21 ton (418.2 cu. ft.) capacity aggregate bin (CPMB rated at 100 lbs. per cu. ft. water level) split width wise into two equal 10.5 ton (209.1 cu. ft.) capacity compartments. Aggregate bin is equipped with a pneumatically operated double clamshell discharge gate complete with air cylinders, single solenoid valves and adjustable gate stops. The aggregate bin is suspended by load cells for accurate decumulative weighing of materials. One air line filter with moisture trap and one air line regulator is provided for use with one to three bins. Each bin is provided with one air line lubricator.

AGGREGATE BIN VIBRATOR
One aggregate bin vibrator supplied for the sand bin. Vibrator is complete with a 2" piston, air hoses and mounting hardware.

AGGREGATE BELT CONVEYOR
For use with 2 bins.
Standard Equipment Includes:
- Twenty four inch (24") wide belt to feed pocket belt with A-frame supports and target hopper.
- 3 roll 35° troughing idlers.
- Bottom return rollers.
- 230/460 volt, 3 phase, 60 hertz, 1800 RPM, TEFC electric motor and gear reducer.

POCKET BELT CONVEYOR
One pocket belt conveyor to convey the aggregate up to the mixer. The pocket belt conveyor consists of the following features: 24" wide x 28' long to charge mixer, overall belt width, 5" corrugated sidewalls, 4 1/2" high cleats on 9" spacing, 230/460 volt, 3 ph, 60 hz, TEFC electric motor drive assembly, 45 degree incline, supports and discharge hood.

CEMENT SILO
270 Barrel capacity (1080 cu. ft.) cement silo:
- 8'-6 Diameter
- Discharge height 7' 6"
- Manhole entrance
- Outside ladder with safety cage
- 4" Cement fill pipe
- Top hand rail with toe board
- Emergency slide gate
- Dust collecting unit with 150 sq. ft. cloth area and air vibrating bag shaker
- 8 Aeration pads and manifold, externally mounted
- Two way solenoid valve

- Moisture trap
- Pressure regulator
- Low level indicator
- Extra silo legs to heighten cement silo

CEMENT SCREW
9" Diameter up to 22' long
- 230/460 V, 3 PH, 60 Hz, TEFC electric motor and gear reducer drive case
- Mounting flanges
- Supports

MODEL E100D BATCH CONTROL

Fully automatic sequential batching of materials. Control utilizes micro computer; one (1) scale for cement/water. Up to six (6) scales for up to 6 aggregates maximum, seven (7) scales maximum. Note: Control has the capability of only one (1) cement /water scale.

STANDARD FEATURES:

General:
- One start button to begin automatic sequence
- One recycle switch for pre-weighing cements and water (sequentially by net weight)
- 25 Mix designs

Materials:
- 2 of 2 Aggregates, batched decumulative, by net weight
- 1 of 1 Cement (or fly ash) batched by screw or gravity, by net weight
- 1 Weighed water, by net weight
- Pre-batching of cements and water

Controls
- Control is powered by 110 volt AC, 60 hertz, single phase electric power
- NEMA 4 control enclosure, 30" x 24" x 8"
- All switchgear is rated NEMA 4x
- Key locked power on-off selector switch
- Manual-auto selector switch
- Manual controls for batching and discharge of all materials
- LCD (backlit) menu driven display readout with 4 lines of 20 characters per line.
- Emergency stop switch located on control panel
- Start-stop switch for incline conveyor
- 10 Second warning alarm for start up of one incline conveyor
- Start-stop switch for mixer
- Aggregate gate jog control
- Automatic gate chatter if no flow is detected through batch gate
- Automatic material free fall correction
- Refill mode for suspending batching while refilling aggregate bins in automatic

- One cement bin low indicator light
- Material inventories of cement, water and aggregates batched in automatic
- Over/under weight checks
- Tolerance band for each material weighed
- Load size selection anywhere from 25%-100% of the selected mix
- Manual moisture compensation for all 6 materials from 0%-25% moisture
- Yield compensation of the various materials will also be compensated
- Plus/minus water adjustment in pounds for all mix designs (slump)
- One time total water deduct in pounds
- Full digital calibration of scales
- Service technician for three day start up

Concrete dump chute from mixer into truck

The above equipment has been designed to conform to OSHA and MSHA standards as we presently understand these requirements. Because of the varying conditions of use of this equipment, no guarantee of compliance with these or other standards is expressed or implied. It is the responsibility of the end user to verify compliance with the appropriate safety regulations before starting the equipment.

CUSTOMER RESPONSIBILITIES

Foundation design, foundation, anchor bolts, plant erection, plant electrical wiring and electric motor starters to meet local codes, water supply and water piping, air supply and air piping, calibration of weighing system, admix dispensing hardware and obtaining all applicable permits.

Customer will provide both mechanics and electricians to assist the field technician during the three day computer start up. It is recommended that the plant operator be in attendance throughout the start up. The customer is also responsible for providing the services of a local scale dealer if such services are required for calibration and scale certification. These services can include: weights, a weight truck and a licensed scale technician.

TOTAL PRICE F.O.B. FACTORY, PEWAUKEE, WI $154,422