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Audit of the Fleet Maintenance Facility
Cape Breton (FMF CB) Shop
Consolidation Project

March 2011

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Caveat

The review of contracts did not include interaction with contractors; only the Department of National Defence (DND)/ Defence Construction Canada (DCC) personnel responsible for the management of the contracts were interviewed.



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Acronyms and Abbreviations

ADM(Fin CS)	Assistant Deputy Minister (Finance and Corporate Services)
ADM(IE)	Assistant Deputy Minister (Infrastructure and Environment)
CF	Canadian Forces
CFB	Canadian Forces Base
CID	Capability Investment Database
CO	Change Order
CONOPS	Concept of Operations
COS(IE)	Chief of Staff (Infrastructure and Environment)
CPS	Construction Phase Services
CRS	Chief Review Services
DBB	Design Bid Build
DCC	Defence Construction Canada
DCPD	Director Construction Project Delivery
DFPPC	Director Force Planning and Program Coordination
DG Fin Mgt	Director General Financial Management
DGME	Director General Military Engineering
DM	Deputy Minister
DND	Department of National Defence
DSFC	Director Strategic Finance and Costing
EM	Economic Model
EPA	Effective Project Approval
FAA	<i>Financial Administration Act</i>
FMF CB	Fleet Maintenance Facility Cape Breton
FY	Fiscal Year
IMS	Integrated Master Schedule
IRM	Integrated Risk Management
L1	Level One
MND	Minister of National Defence
OPI	Office of Primary Interest
PAG	Project Approval Guide



PL	Project Leader
PM	Project Manager
PMBOK	Project Management Body of Knowledge
PMO	Project Management Office
PMP	Project Management Plan
PPRA	Project Profile and Risk Assessment
QPM	Quality Policy Manual
RMP	Risk Management Plan
SLA	Service-Level Agreement
SOR	Statement of Operational Requirements
SRB	Senior Review Board
TB	Treasury Board
VCDS	Vice Chief of the Defence Staff
WP	Work Package



Synopsis

In 2009, Chief Review Services (CRS) undertook an audit of the FMF CB Shop Consolidation Project at Canadian Forces Base (CFB) Esquimalt. The implementation of the initial five-year Phase III of the project, which represented the majority of the construction of the facility, was approved in July 2000 and was to be completed in 2005.

The main objective of this audit was to assess the controls, risk management and governance processes in place to deliver the FMF CB infrastructure replacement project.

While there was sound management of the construction portion of the project, the audit found that 80 percent of the increase in project costs was related to external factors such as market volatility in the Vancouver Island area and increased project contingencies to cover potential future volatility. At the time of the audit, \$117 million of the projected \$608 million had been expended. In 2006, the project implementation was delayed to deal with the increasing costs and to ensure that approved budget amounts were not exceeded.

Since the project's 1992 original Statement of Operational Requirements (SOR), DND/Canadian Forces (CF) senior executives and central agencies had been provided with relevant and complete information prior to granting approval through the various stages of the project. The project is now planned to be completed in 2015, and an annual report to Treasury Board (TB) on the progress of the project will be prepared.

In light of the market volatility experienced in projects such as the FMF CB Shop Consolidation, management has implemented measures that will help projects develop more timely and accurate substantive estimates. For example, to ensure that the impact of current market conditions is factored into the estimates, the DND Economic Model (EM) is now being updated more frequently and project offices can use local (as opposed to regional) escalation indices when these are more indicative of market conditions. As well, since 2003 independent cost validation is mandatory for all projects. Furthermore, in April 2010, a departmental cross-functional working group was put in place to streamline the approval process, which should significantly reduce the time required to obtain additional funding.

CRS is satisfied that implementing various actions, such as those mentioned above, will minimize the likelihood of recurrence of the issues that have contributed to the FMF CB project cost increase. Follow-up to ensure effective implementation of the action plan will be completed as required.



Results in Brief

In 2008, CRS identified the FMF CB Shop Consolidation Project at CFB Esquimalt as warranting audit due to projected cost increases and delays in the delivery of the project.

The initial five-year Phase III FMF CB Shop Consolidation Project was approved in July 2000 with a \$91.9-million substantive estimate. The project has spanned many years and there have been a number of improvements and changes in how construction projects are managed in the Department. This infrastructure recapitalization project proposed to upgrade and modernize the infrastructure and industrial processes for the ship repair maintenance facility located in Esquimalt. The project was expected to provide 20-percent efficiency gains and resolve health and safety issues following its initial 2005 proposed completion date. The project office worked closely with DCC, which is the organization responsible for tendering and awarding DND construction contracts and providing project management services.

Overall Assessment

- Additional governance measures, internal controls, and risk management could improve the FMF CB project implementation.
- Key contract deliverables should be better linked to payments in order to maximize value for money.

Findings and Recommendations

Project Costs. External factors such as market volatility over several years in the Vancouver Island area resulted in \$241 million in higher than initially forecasted construction cost estimates and a project duration of several additional years. Moreover, a corresponding increase in contingencies of \$169 million to cover potential future volatility caused the revised project estimate to increase to \$607.7 million¹ once the project is completed in 2015. At the time of audit, \$117 million had been expended on the project. The CRS audit team was advised that due to the current state of the economy, contractor bids for the construction of Phase IV were significantly lower than projected. If this situation persists, actual costs could be lower than the projected costs.

It is recommended that DND escalation models be developed for key CF bases rather than on a regional basis.

¹ The project values were approved in February 2009.

Contract Management Value for Money. The basis of payment for the design and the main construction contract did not optimize value for money. For example, the \$3.8-million design contract had \$3.2 million as fixed-price for the design work and \$611,000 as time-based to support the construction of the project. Although the scope of the overall project did not change, the re-phasing of the project caused the design costs to grow to \$11.2 million. The fixed-price portion of the design contract could have been better linked to deliverables.

The construction contract claims were reviewed thoroughly and DCC successfully reduced the amounts from the initial claims.

It is recommended that payments and incentives be better linked to key deliverables.

Service-Level Agreements (SLA). DCC and DND have annual SLA's to describe the project and contract management services that will be provided by DCC. Although there are clear DCC responsibilities identified in the Director Construction Project Delivery (DCPD) Quality Policy Manual (QPM), the SLA did not specify key deliverables with corresponding benchmarks that were expected from DCC.

It is recommended that DND comply with the QPM by developing SLAs with relevant and measurable deliverables. Payment for DCC services should be linked to the deliverables.

Project Leadership/Management Capacity. The Project Approval Guide (PAG) guidance for project leaders (PL) is not risk-based. The current FMF CB PL is under-ranked based on the PAG guidance. Also, based on the number and type of project, the FMF Project Manager (PM) had the second-highest workload score within DCPD, where each PM carries 10 construction projects on average with complete reliance on DCC project management staff.

It is recommended that the PAG be amended to allow a risk-based assignment of PL for all projects, including Assistant Deputy Minister (Infrastructure and Environment) (ADM(IE)) projects. As well, it is suggested that DCPD review the construction PM model assumptions and reconsider whether these are sufficient for effective project delivery.

Mandatory Project Documentation. Key project documents now required in the PAG that were not introduced until several years into the project—such as a new project charter format, a Project Management Plan (PMP) and Senior Review Board (SRB) checklists—have not been completed nor updated. Not all of these documents are included in the DCPD QPM, the principal guide for ADM(IE) construction project management.

It is recommended that the Vice Chief of the Defence Staff (VCDS) review the PAG and ensure the guidance is appropriate for construction projects.



Risk Management. ADM(IE) guidance did not include risk likelihood assessment guidance, and risk thresholds were not consistent with those in the DND Integrated Risk Management (IRM).

It is recommended that the DCPD QPM be revised to include risk likelihood assessment, risk impact thresholds aligned with DND IRM, and that the Project Management Office (PMO) manage project risks accordingly.

Note: For a more detailed list of CRS recommendations and management response, please refer to [Annex A](#)—Management Action Plan.



Introduction

Background

The FMF CB Shop Consolidation Project is an infrastructure recapitalization initiative that will refine the arrangement of older industrial buildings within CFB Esquimalt's "Ship Repair Zone." The project will also upgrade the site infrastructure (utilities and road system) as well as facilitate a fundamental modernization of FMF CB's industrial processes. The project objectives are to:

- Provide DND/CF with a modern and consolidated strategic maintenance facility;
- Reduce the FMF CB footprint and create facility operational and maintenance savings;
- Increase FMF CB productivity by at least 20 percent; and
- Improve the work environment and address health and safety concerns.

[Annex D](#) contains a project chronology of the key decision points in the project. It demonstrates that the Department was transparent and obtained all the required approvals prior to proceeding with the project. The multi-phased project entered the definition stage in 1995. The implementation of Phases I and II of the FMF CB Shop Consolidation Project occurred in 1996 and 1998, respectively, providing a new building for the Regional Calibration Centre and upgrading the electrical supply and distribution service to and within CFB Esquimalt's Naden and Dockyard Sites (Phase II).

In 2000, the project began the implementation of Phase III with a plan to complete the consolidation project by 2005. By 2003, it was apparent that the combination of insufficient funding levels and external factors such as escalating construction costs made it impossible to complete the work within the \$91.9-million budget. After consultation with senior management, the project deliverables were scaled back to remain within the spending authority.

In mid-2004, the SRB endorsed that the project be restructured by creating Phase IV and V for the remaining work. An increase of \$44.5 million for Phase IV was approved in July 2005 with documentation that further approvals would be required to finish Phase V of the project. By mid-2006, it was apparent that Phase IV could not be completed within the \$136.4-million budget and subsequently senior management and TB were made aware of the situation. Once again, the project office slowed down planned project work in order to avoid exceeding the expenditure authority and to assess the situation.

In 2009, an additional \$176.1 million was projected for Phase IV implementation work and \$19.1 million for Phase V definition work. The indicative cost estimate for the implementation of Phase V was \$276.1 million, which included a \$127.3-million contingency to complete the project by 2015 for a revised total cost of \$607.7 million.



Objectives

The objective of this audit was to assess the adequacy of risk management, controls, and governance processes in place to deliver the FMF CB infrastructure replacement project.

Scope

The audit scope included:

- FMF CB Shop Consolidation Project work from definition in 1995 to the Phase V implementation plan in February 2009; and
- Project Phase III and Phase IV contracts and financial review of \$117-million project expenditures from January 2000 to January 2009, including a detailed review of \$16 million in vendor claims.

Methodology

- Interviews with Chief of the Maritime Staff, ADM(IE), Assistant Deputy Minister (Finance and Corporate Services) (ADM(Fin CS)) staff, and DCC staff;
- Examination of project documents—Project Profile and Risk Assessment (PPRA), SOR, Project Charter, and synopsis sheets for approval;
- Examination of ADM(IE) and DCC policies and procedures;
- Review of contract management practices that relate to *Financial Administration Act* (FAA) Section 34 Payment Certification;
- Benchmarks on construction project management practices;
- Data analysis—Financial Managerial Accounting System, Financial Information System, Pyramid and Change Order (CO) data analysis; and
- Site visits with end users at CFB Esquimalt.

Audit Criteria

The audit criteria and rating can be found in [Annex B](#).



Findings and Recommendations

Project Costs

Revised projected costs exceed the original budget primarily because of unforecasted external factors not reflected in the DND EM, increased contingencies to cover potential future fluctuations and a lengthy project approval process.

DND Economic Model

The DND EM is used to forecast construction costs in the Department. However, the DND EM used for forecasting escalation was not accurate. Project cost escalation, due to external factors that were not reflected in the EM, was \$241 million between 2002 and 2006.

- From 2002 to 2006, the DND EM for construction in British Columbia indicated an appreciation of costs of 13.8 percent, while other sources cited escalation for the Vancouver Island region to range from 50 to 80 percent for the same time period.²
- The EM construction model is tailored to regions or areas (i.e., BC, Atlantic, Prairies) and not to specific large DND locations such as CFB Esquimalt. The EM escalation rates prescribed were inconsistent with Vancouver Island escalation rates and economic indicators.
- An analysis of the new construction in the 10-year DND Infrastructure Investment Plan indicated that 68 percent of the realty asset values will be located at 10 CF bases, as portrayed in [Annex C](#).

Contingency Growth

Contingency funds are budgeted for unforeseen, possible or chance occurrences that may increase project costs, and may only be released with the approval of the SRB.³ The contingency funds for the project grew from \$8.7 million in July 2000 to \$178 million in February 2009—24 percent of the project total. The current practice is to include a 10-percent design allowance which was not included in the 2000 budget. Normally, contingency ranges from 10 to 13 percent of total project costs.⁴ Contingency was higher for this project to account for the volatility and increasing construction prices in the Vancouver Island area. Also, it was the first project for which Director Strategic Finance

² “Root Cause Analysis Project 00004360 FMF Cape Breton Shop Consolidation Project CFB Esquimalt, B.C.” Irvin Kew Architecture Inc. & Thornley BKG Consultants Inc., 10 January 2007.

³ Project Approval Guide 4.2.15.

⁴ A benchmark with 13 other construction projects over \$10 million in Effective Project Approval (EPA) phase indicates that the average contingency percentage of project costs is 12.7 percent.



and Costing (DSFC) performed a project cost risk analysis using Oracle’s Crystal Ball application suite.⁵ By continuing to use Crystal Ball or other advanced simulations, the Department may be able to improve project cost estimates.

Initial Substantive Project Cost Estimate

The original Phase III implementation plan was tabled for approval at the 7 June 1999 SRB meeting with an EPA cost estimate of \$91.9 million. This estimate was calculated based on value engineering⁶ of the February 1999 Thornley construction estimate⁷ to adjust for various cost savings items and construction phase efficiencies. |||||
|||||
It should be noted that at the time of the approval, the project files indicated that senior management was aware of the possibility of future cost over-runs and was prepared to subject the project to additional oversight if needed.

The project file lacked documentation to fully substantiate the gap between the estimates proposed by the consultants and the \$91.9-million expenditure authority that was included in the approval documents. Better documentation and records must be maintained in the future to support the decisions made in preparing the final project estimates.

Design Process

The architectural and engineering design work that was originally for Phase III grew from approximately \$3.8 million to a current projection of \$26 million.⁸

Sixty-two percent of the project COs were related to design changes.⁹ The value of the design contract COs were over four times the normal value of design contract changes.¹⁰ The design COs were higher than average for the following reasons:

⁵ “Chapter 11: Costing Validation Process.” DSFC, DND, April 2006. Monte Carlo results are computational algorithms that rely on repeated random sampling. Source: Douglas Hubbard “How to Measure Anything: Finding the Value of Intangibles in Business,” John Wiley & Sons, 2007, page 46.
⁶ Value engineering is a process that will enable the identification, assessment, development and definition of changes and/or enhancements that have the highest potential for improving value-added performance and for achieving optimum project capital cost and optimum material, equipment and system life-cycle cost. Source: ADM(IE) QPM 7.34BW01.
⁷ “Final Substantive Estimate for Fleet Maintenance Facility Cape Breton Shop Consolidation.” Construction estimate only of approximately \$64 million, Thornley Consultant Group Inc., 3 February 1999.
⁸ Phase III and IV prime consultant costs grew from \$4 million to \$11 million. The Phase V design work was priced at \$15 million in 2010.
⁹ Percentage of number of COs.
¹⁰ Total value of design COs represented 29.9 percent of initial value, which was much higher than average DCC projects of 6.2 percent between fiscal year (FY) 2000/01 and FY 2007/08.

- The contracting strategy was changed from Design Build¹¹ to Design Bid Build¹² (DBB) where 60 percent of the design is usually completed before seeking approval. Although not reflected in the DCPD QPM, the remaining 40 percent design work is done in the definition stage while waiting for approval of the implementation. However, for the FMF CB Project only 20 percent of the design was complete before the implementation phase funding was sought in 1999.
- Production of the Concept of Operations¹³ (CONOPS) by the DND project team was delayed due to the changes in contracting strategy and the design consultant. The new consultant required much more detailed input than DND expected on the operational requirement from what was contained in the original CONOPS. Accordingly, the updated CONOPS was not finalized until well into the Phase III implementation phase when 50 percent of the design had been completed.
- The operational requirement evolved to meet changes in FMF CB roles and capacity. For example, the FMF CB work force increased from approximately 800 to 1,300 personnel due in part to a new submarine maintenance requirement.
- Better communication between the end user and design consultant would have improved the design process. The PMO requested the input of the ADM(IE) design review service to review technical design aspects during the design stages, but they were not available to the project, and also the user requirement was not finalized at each design stage. It is suggested that the PMO complete a significant portion of the design process with the agreed upon requirements prior to proceeding with Phase V implementation.

Approval Process Delay

The FMF CB project went through three expenditure approvals between 1999 and 2009 due mostly to increasing construction costs in the area. The approvals were required to ensure appropriate funding was available to complete the project requirements. Due to the lengthy project approval process, each approval took considerable time which added to the projected costs. For example, the approval of the Phase IV funding took over 527 calendar days to obtain. The lengthy project approval submission process will be addressed as a result of a CRS review in 2009.¹⁴

Delays

\$55 million of the FMF projected productivity gains will not be realized due to a 10-year delay in the delivery of the project.

¹¹ A contract with a single firm for the design and construction of a project. Source: ADM(IE), QPM 7.30AP01.

¹² Separate contracts for the design and for the construction of a project. Source: ADM(IE), QPM 7.30AP01.

¹³ CONOPS describes how the realty asset will be used, by whom, and under what operational conditions. Source: ADM(IE), QPM 7.20CT03.

¹⁴ 2009 CRS Treasury Board (TB)/Minister of National Defence (MND) Submission Process Review (<http://www.crs-csex.forces.gc.ca/reports-rapports/2009/169P0894-eng.asp>) suggested a target of 105 days.



Recommendation

Additional escalation models for key CF bases should be established.

OPI: ADM(Fin CS)/DG Fin Mgt/DSFC



Contract Value for Money Oversight

Basis of payment incentives that are linked to key deliverables would provide better value for money to the Crown.

Design Contract

The original Phase III design contract was a \$3.2-million fixed price for the design (architectural and engineering) work, plus a \$600,000 time-based estimate for the construction phase services (CPS). The contract value increased from \$3.8 million to \$11.2 million, although it was de-scoped to exclude portions of Phase IV and all of Phase V. The supporting documentation did not provide sufficient assurance as to the amount of design work completed prior to payment.

- Payment for the fixed-price portion was based on an estimated percentage of work completed at the time of the claim, as opposed to a clear deliverable. The DND PM reviewed and certified the percentage of design work completed on a monthly basis but the contract did not specify the supplier documentation such as timesheets or the number of drawings completed to ascertain whether the work was completed. A more comprehensive and detailed presentation of the work completed on each claim that was consistent with the project work packages (WP) would provide better support for the amounts claimed.
- CPS fees increased from the initial contract price of \$611,000 to a current estimate of \$1.6 million. Improvements were made to track and validate CPS through the implementation of an enhanced task management system. Sample audits of tasks should have been performed for CPS labour charges to ensure they were consistent with the level of effort.

Construction Contract

For the \$45.9-million fixed-price Phase III prime construction contract, FAA Section 34 certifications were applied rigorously. Claims were successfully challenged by DCC staff and amounts reduced on the basis of work completed. Work performed was recorded in daily diaries, and on-site deliveries of fixed-fee items were closely monitored.

Section 34 Certification

Application of Section 34 certification by DCC site inspectors resulted in reductions worth \$620,000 on sampled claims.



Basis of Payment

The current basis of payment for construction and design contracts could have a greater emphasis on the accomplishment of key milestones and deliverables. For design contracts, consideration should be given to linking some incentives such as firm award fees or holdbacks to key deliverables. Metrics from earned value management, such as schedule performance index¹⁵ and cost performance index,¹⁶ would enable the PM to track design contracts against initially established schedule, scope, and cost.

Warranty

In a DBB environment, there is no single point of accountability for warranty concerns for both design and construction efforts. Although the contracts include warranty clauses for design and construction work, the cost of construction rework resulting from an error in design is not covered in the contract. The audit team was unable to evaluate the cost of rework resulting from a defect in design or an end user change, as this was not identified in the construction contract CO documentation.

Bid Evaluation Process

An improvement was noted in the bid evaluation process for the design consultant. Risk management, schedule and cost control, which were missing from the initial bid evaluation process in 1999, were later added as criteria to evaluate the bidders.

According to the Request for Proposal in 1999, the cost of services criterion was weighted as 10 percent of the overall bid evaluation score of a firm's proposal. In the event that overall scores of the top-ranked firms are tied or within one point of each other, the firm with the lowest cost proposal is to be selected. The design consultant retained for the project met all the technical requirements, but was selected based on the lowest cost bidder with a proposal valued at \$3.8 million. In addition to being the lowest bid, the bid was also \$2.1 million¹⁷ below the PMO's estimated cost for the project (\$6 million) and the industry norm.¹⁸ With this significant difference in estimate, it is unclear whether the winning consultant's assessment of the project's scope was accurate.

¹⁵ Schedule performance index equals budgeted cost of work performed divided by budgeted cost of work scheduled.

¹⁶ Cost performance index equals budgeted cost of work performed divided by actual cost of work performed.

¹⁷ The winning design consultant's bid provided for approximately 700 drawings while the initial PMO estimate was for 1,100 drawings—a difference valued at \$2.1 million.

¹⁸ Industry norm expects design fees to be in the range of 10 percent of estimated cost of construction.



An assessment of the lowest bid against DND/DCC's estimated cost and level of effort for a project, and/or against industry standards, could help in evaluating the bidder's understanding of a project's scope, challenges and requirements.

Recommendation

Payments should be linked to key deliverables and, for design contracts, an incentive-based basis of payment should be established.

OPI: ADM(IE)



Service-Level Agreements

Payments for DCC services are not sufficiently linked to defined deliverables.

DCC/DND Service-Level Agreement

DCC is a Crown Corporation that provides a variety of services, including contract and project management services, in support of ADM(IE) infrastructure projects on a fee-for-services basis.¹⁹

Two principal annual SLAs between DND and DCC defined the contract and project management services to be provided in the FMF CB project.²⁰ In this connection, the audit noted that:

- Although the DCPD QPM²¹ states key deliverables will be identified in the SLA, they were not clearly defined. For example, according to the quality manual,²² DCC is responsible for key deliverables such as the DCC Contract Compliance Plan, the Commissioning Plan and Report acceptance, Operations and Maintenance Manual acceptance, but these deliverables have not been identified in the SLA. Also, the two SLAs identify several services to be provided with minimal measurable deliverables required.²³
- The delivery standards do not follow the S.M.A.R.T methodology (specific, measurable, attainable, relevant, time-bound) required in the Joint DCC/DND Management Handbook²⁴ for SLAs. For example:
 - Delivery standard schedule management is qualitative in nature. It is based 100 percent on a Client Satisfaction Survey that involves DND's completing a client satisfaction report. There are no quality benchmarks to measure the performance of schedule management.

Key Performance Indicators

Of the 14 DCC corporate performance measures, six relate to customer requirements. Although three of the six customer performance measures had quantified targets, the most significant measures, such as the percentage of successful contract awards, schedule slippage, and cost increase, did not have targets against which to assess performance. It is suggested that ADM(IE) request DCC to establish performance targets for all key indicators.

¹⁹ From a sample of 13 ADM(IE) projects the average DCC fee was 4 percent of the total project costs.

²⁰ For FY 2009/10, the SLAs were valued at approximately \$850,000 for the DCC service regarding the FMF CB project. The two principal SLAs were:

- Contract Management Services, 1 August 2009, time-based.
- Program and Project Management Services, 1 April 2009, time-based.

²¹ 7.40BW05 DCPD Quality Manual.

²² 7.51AP01 DBB responsibility assignment matrix identifies the roles and responsibilities assigned.

²³ The SLAs identify the monthly status and cash flow as the key deliverable.

²⁴ 3.3.6 February 2009 Joint Management Handbook for Service-Level Agreements.



Recommendation

DCPD should develop SLAs with measurable performance indicators and link DCC payments to key deliverables.

OPI: ADM(IE)



Project Leadership/Management Capacity

PL rank is not consistent with the PAG or the level of project risk. More PM resources are needed to ensure efficient and effective delivery of construction projects.

Project Leader

The PL is accountable to resolve major project issues. The current ADM(IE) practice for assigning a PL does not follow the departmental guidance in the PAG nor does it assign PLs based on the risk of the project. Currently, the PAG sets the rank of the PL based on the project dollar value. Based on these thresholds, the FMF CB PL is under-ranked.

Currently, ADM(IE) assigns a Director as the PL based on a threshold of less than \$30 million and a Director General for projects greater than \$30 million. ADM(IE) has not acted as PL for any high-value or higher-risk projects. For a higher-risk project, a high-ranking PL should be more engaged. Tables 1 and 2 demonstrate an option of a risk-based approach to PL assignment. Similar results were found if the same PL thresholds were applied to the Capital Equipment Program.

Risk Profile	\$5-\$30M	\$30-\$60M	\$60-\$100M	>\$100M
High	COS(IE)	ADM(IE)	ADM(IE)	ADM(IE)
Medium High	DGME	COS(IE)	ADM(IE)	ADM(IE)
Medium	DGME	DGME	COS(IE)	ADM(IE)
Medium Low	DCPD	DGME	DGME	COS(IE)
Low	DCPD	DCPD	DGME	COS(IE)

Table 1. Construction PL Assignment Thresholds. These thresholds are risk- and project-value based.

	Number of Projects	Percentage of Projects	Value of Projects (\$M)	Percentage of Project Value
ADM(IE)	5	4.8%	\$ 3,710	46.8%
COS(IE)	5	5.8%	\$ 2,191	27.6%
DGME	26	28.7%	\$ 776	9.8%
DCPD	56	60.7%	\$ 1,258	15.8%
Total	92		\$ 7,935	

Table 2. ADM(IE) PL Assignment Results. Based on the construction project submission in the VCDS project tracker in 2009, a more equitable risk-based distribution of project leadership is possible.

Project Manager Capacity

Increasing the number of project management resources within ADM(IE) would improve the oversight of all the construction projects. At the time of audit, the ADM(IE) project delivery group had 29 PMs managing 283 projects²⁵—an average of 10 projects per PM with no other DND staff to assist in project management. ADM(IE) relies on DCC PM resources assigned through SLAs to help manage construction projects. For Assistant Deputy Minister (Materiel) equipment projects, there are over eight project management personnel resources per project and usually not more than one project per PM.

The current PM of the FMF CB project had the second-highest workload scoring in the DCPD PM capacity model. The model was based on a baseline of eight projects per PM depending on the project phase. Although individual project risk and PM skill sets were considered when assigning projects, they were not yet built in the PM model criteria. DCPD should reconsider the PM model assumptions and look at building further PM capacity and PM support in the Department.

Recommendation

A risk-based approach should be used for PL assignment for all projects, including ADM(IE) projects.

OPI: VCDS

²⁵ There was a plan being implemented by DCPD to bring in another 11 PMs to handle the increased workload.



Key Project Management Documents

A PMP, Project Charter, Integrated Master Schedule (IMS), and action plans for a Root Cause Analysis require completion. Performance indicators are required to assess whether the project meets the 20-percent productivity improvement objective.

Mandatory Project Documents

Some mandatory documents,²⁶ such as the Project Charter, PMP, and SRB Checklists²⁷ were not completed nor updated. According to VCDS direction, these are iterative documents that must be completed and updated as they are used by senior management in support of capability-based planning in DND. Since projects sponsored by ADM(IE) are also required to follow DCPD quality procedures in implementing projects, clarification is required as to whether or not construction projects are required to follow the PAG.

Integrated Master Schedule

Currently, there are only schedules for individual contract and associated WPs. According to VCDS direction on the content of a PMP, a formal detailed IMS should be in place, with a “critical path” that identifies interdependent activities.²⁸ The schedule should be structured to correlate to the project Work Breakdown Structure. The project office plans to have an IMS in place for Phases IV and V.

Root Cause Analysis: Action Plans

The project does not have action plans in place to address issues brought up in the Root Cause Analysis from January 2007 and the Phase IV Project Risk Analysis completed in April 2008. DCPD quality procedures require root cause action plans in order to facilitate a corrective or preventative action so that any arising issues are addressed.

Performance Measures

A baseline has not been established by FMF CB to measure the 20-percent productivity improvements forecasted in the 2008 documentation. The FMF CB Comptroller needs to establish improvement indicators and a baseline to determine if project efficiency objectives are met once FMF CB has been physically consolidated.

Recommendation

The VCDS should review the PAG and ensure the guidance is appropriate for construction projects.

OPI: VCDS

²⁶ 3136-1 (DFPPC 6-2) Capability Investment Database (CID), 25 October 2004.

²⁷ SRB checklists are mandatory and there have been no revisions to this section of the PAG since 2003, PAG, Chapter 2, 2.5.13 and 2.5.15.

²⁸ CID PMP Template—Project Detailed Schedule.



Risk Management

Risk management improvements are required to continuously address project risks in a consistent manner.

It should be noted that the departmental risk management environment in 1995, when the project started, was quite different than that of today. The current departmental policies and guidelines were not applicable to the project's risk management at its early stages. Today, it would be appropriate for the FMF CB Shop Consolidation Project to adhere to current risk management policy to help identify opportunities for improvements for future phases of the project.

Risk Management Guidelines

Consistent risk management guidelines not only reduce confusion for project staff, but also enable senior management to make decisions based on the risk levels of different projects. In comparing different risk management guidelines, some inconsistencies were observed:

- The DND IRM²⁹ requires that risks be assessed based on both impact and likelihood. In contrast, ADM(IE) QPM³⁰ does not include guidelines for assessing risk likelihood, and its thresholds for assessing risk impact are also different from those in the IRM policy.
- Risk Management Plan (RMP) templates in the QPM³¹ and DCC Operational Manual³² are risk registers and do not have all the RMP elements as listed in Project Management Body of Knowledge (PMBOK).³³

Innovative Management Practices

To reduce risk, a Monte Carlo simulation was conducted for FMF CB that quantified project cost contingency, risk reserve, and schedule contingency for Phase IV of the project.

Risk Assessment

Project Risk Management documents (PPRA, RMP) assigned risk levels to each risk identified. However, the risk levels could have been more useful if they were based on the assessment of risk likelihood and impact. The benefit of doing so is that risks can be ranked more precisely so that the PMO can focus on high-priority risks.

²⁹ VCDS, DND/CF IRM Guidelines, January 2007.

³⁰ ADM(IE), Quality Policy Manual, 7.10BW02, 9 April 2003.

³¹ ADM(IE), Quality Policy Manual, 7.10DF01, 9 April 2003.

³² DCC, Operations Manual, Section 3.4.8, 13 October 2004.

³³ Project Management Institute, PMBOK 3rd Edition, Chapter 11.1.3, 2004 is referred to in the DCC Operational Manual.



Recommendation

Update the QPM to include risk likelihood assessment, impact thresholds aligned with the DND IRM and the PMBOK RMP content, and manage project risks accordingly.

OPI: ADM(IE)/DGME/DCPD



Annex A—Management Action Plan

Project Costs

CRS Recommendation

1. Additional escalation models for key CF bases should be established.

Management Action

DSFC has instituted the following measures in order to mitigate the inflation concerns:

- The EM is updated twice a year instead of annually to capture any changes in construction prices;
- Local construction indices can be utilised by PMs in their estimates if they exceed the EM after consultation with DSFC; and
- DSFC has created market volatility contingency that can be applied to the estimates when local markets are unstable.

ADM(IE) will ensure that project sponsors and managers are aware of these measures for future projects.

OPI: ADM(Fin CS)/DG Fin Mgt/DSFC

Target Date: Completed

Contract Value for Money Oversight

CRS Recommendation

2. Payments should be linked to key deliverables and, for design contracts, an incentive-based basis of payment should be established.

Management Action

ADM(IE) staff will work together with DCC to review and revise, as appropriate, the basis of payment for DND construction and design contracts. The need for a direct linkage between payment and the accomplishment of key deliverables is a fundamental project management principle that ADM(IE) supports and, in fact, is reflected in the DGME QPM as a key element of the construction project management process.

ADM(IE) and DCC staff will consider a variety of approaches to implement the linkage between measurable performance and payment including, but not restricted to, a review of metrics such as the schedule performance index and the cost performance index.



Annex A

In addition, in consultation with ADM(IE), DCC is using to varying degrees (dependent upon the nature and complexity of the designs) the following three key contract management procedures to facilitate prudence and probity from contract award to completion:

- Cost management that includes the monitoring of costs against plan, ensuring required changes are recorded against the plan, and preventing unauthorized change and communication revisions to the plan.
- Allocation of consultant fees through a Task Management System that allows DCC to manage the apportionment of consultant fees to discrete manageable elements of work.
- Earned value method that allows project managers to measure the progress of the work against defined deliverables. This method has been introduced recently to address concerns with projects that have had increased design costs.

OPI: ADM(IE)

Target Date: Revisions to procedures will be completed by 1 April 2011

Service-Level Agreements

CRS Recommendation

3. DCPD should develop SLAs with measurable performance indicators and link DCC payments to key deliverables.

Management Action

Action will be taken to ensure that key deliverables are defined in all future SLAs in accordance with the DGME QPM and the Joint DCC/DND Management Handbook.

ADM(IE) staff will also define more objective benchmarks for determining if project schedules are being achieved and these will be documented in the Joint DCC/DND Management Handbook.

OPI: ADM(IE)

Target Date: March 2011

Project Leadership/Management Capacity

CRS Recommendation

4. A risk-based approach should be considered for PL assignment for all projects, including ADM(IE) projects.



Management Action

VCDS supports reiteration of current guidelines for project governance. Level One's (L1) should also be given the opportunity to assess and recommend on the value and achievability of assigning project leadership based on risk as well as cost.

OPI: VCDS

Target Date: January 2011

Key Project Management Documents

CRS Recommendation

5. The VCDS should review the PAG and ensure the guidance is appropriate for construction projects.

Management Action

The PAG is currently being updated and rewritten, and efforts will be made to ensure that it is appropriate for all major projects, including construction.

OPI: VCDS

Target Date: January 2011

Risk Management

CRS Recommendation

6. Update the QPM to include risk likelihood assessment, impact thresholds aligned with the DND IRM, the PMBOK RMP content, and manage project risks accordingly.



Management Action

The DGME QPM will be updated to include RMP elements of the PMBOK and risk impact and likelihood elements from the DND IRM.

Moreover, to respond to the Canada First Defence Strategy Infrastructure Investment goals and to ensure that available departmental infrastructure funding is spent effectively on the highest priorities of the DND/CF, using a risk-based management approach, ADM(IE), in consultation with the VCDS, ADM(Fin CS) and the L1 custodians, is taking actions to implement a DND/CF infrastructure portfolio management control framework, including the adoption of a centralized management approach to the stewardship of the Department's infrastructure portfolio. The new framework is designed to minimize the likelihood of the recurrence of the issues that have contributed to the FMF CB Project cost increases.

OPI: ADM(IE)

Target Date: QPM updates will be completed by 1 April 2011; the elements of the DND/CF infrastructure portfolio control framework will be implemented over the next two years.



Annex B—Audit Criteria

Criteria Assessment

Level 1 (Satisfactory); Level 2 (Needs Minor Improvement); Level 3 (Needs Moderate Improvement); Level 4 (Needs Significant Improvement); Level 5 (Unsatisfactory)

Risk

1. **Criteria.** Risks are identified, assessed, ranked, mitigated, quantified, reported by the Project Office and by the vendors with clear linkage to contingency funds.

Assessment. Level 2—Risk assessment not in accordance with IRM/PMBOK and guidelines inconsistent. Monte Carlo contingency analysis performed.

Governance

2. **Criteria.** Roles and responsibilities are defined and appropriate skills, staff, and resources are available to govern project.

Assessment. Level 4—PL is under-ranked for this and other infrastructure and environment projects and for Project Review Committee meeting; lack of appropriate DND PM resources to perform responsibilities.

3. **Criteria.** Project approval and monitoring processes with accurate information for decision making are in place in an ethical environment.

Assessment. Level 2—Project Charter not updated. PMP, IMS, and action plans incomplete; improvements required for the SRB and SRB checklist.

Control

4. **Criteria.** Cost estimates are based on reliable and relevant information from valid sources, and consisting of appropriate contingency funds.

Assessment. Level 4—Insufficient expenditure authority requested from Phase III IMP. EM does not sufficiently address regional escalation.

5. **Criteria.** Assets are managed and payments are made in accordance with the *FAA* and TB/DND policies.

Assessment. Level 3—Not all payments are directly linked to key deliverables for design consultants, construction contractors, and DCC.



6. **Criteria.** The procurement plan, bid evaluation, and contract terms and conditions provided assurance on value for money.

Assessment. Level 3—Terms of payment not incentivized; warranty clauses are deficient for consultants; high value of COs; bid evaluation concerns regarding best value.

7. **Criteria.** Valid objectives and requirement are in accordance with defence construction policy/standard, complete, prioritized, consistent and tracked throughout the project activities.

Assessment. Level 3—Change in procurement plans created insufficient design; design review concerns.



Annex C—Construction Investment Plan

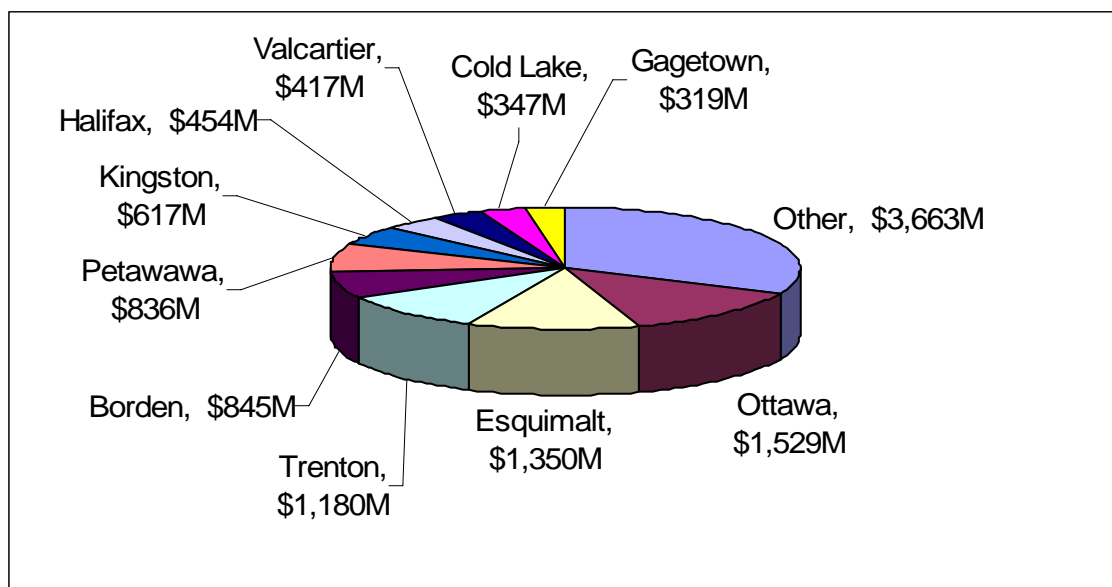
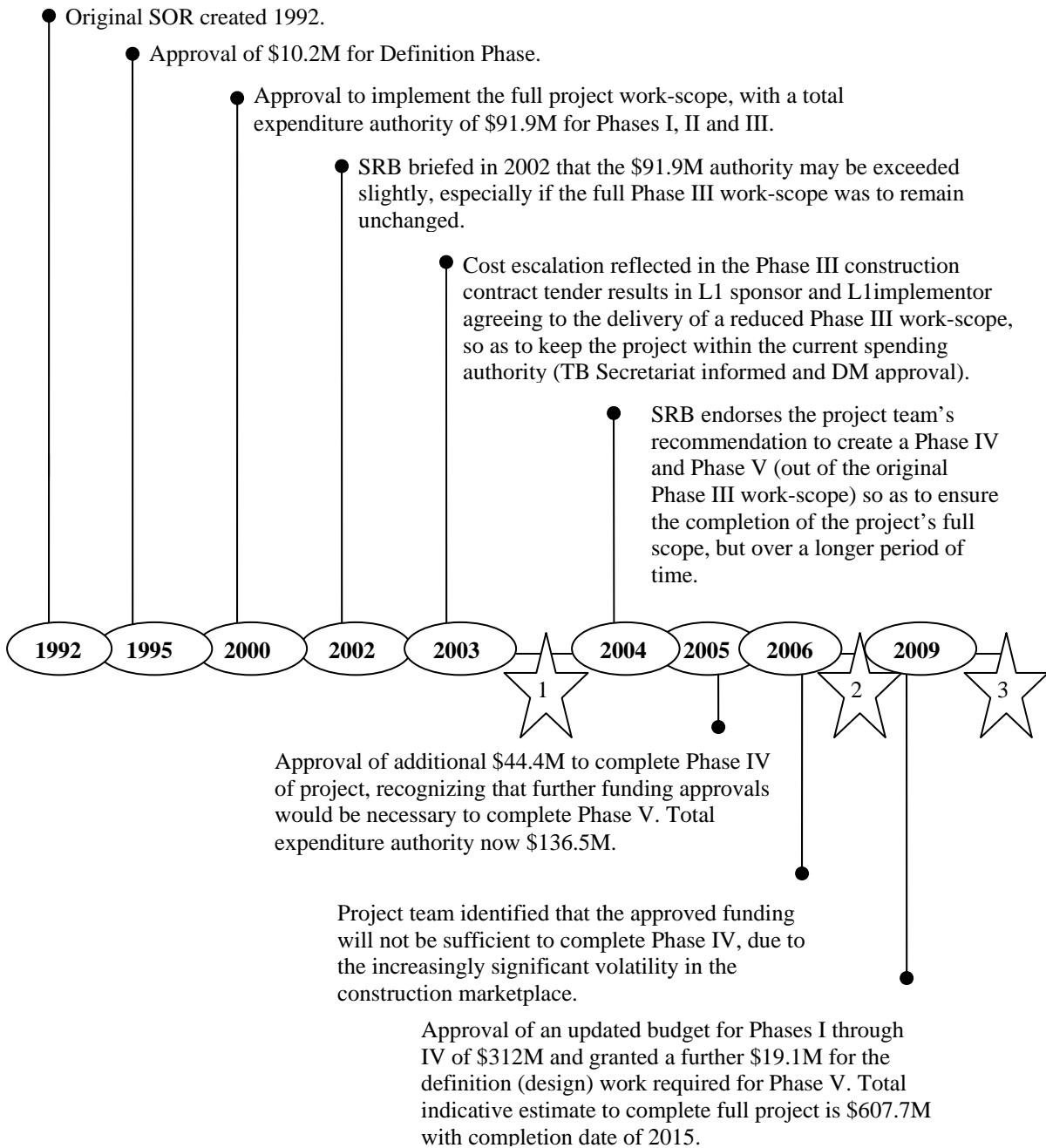


Figure 1. Infrastructure Investment Plan 2010-2020. As shown in this pie chart, 10 bases represent 68 percent of the total planned investment (\$11.6 billion over the next 10 years). The data is summarized in Table 3.

Serial	Location	Investment (\$M)	Percentage of Total
1	Gagetown	\$319	3%
2	Cold Lake	\$347	3%
3	Valcartier	\$417	4%
4	Halifax	\$454	4%
5	Kingston	\$617	5%
6	Petawawa	\$836	7%
7	Borden	\$845	7%
8	Trenton	\$1,180	10%
9	Esquimalt	\$1,350	12%
10	Ottawa	\$1,529	13%
	Top 10 locations	\$7,893	68%
	Various	\$3,663	32%

Table 3. Infrastructure Investment Plan 2010-2020. The top 10 locations represent 68 percent of the planned future investments over 10 years. The other locations represent the remaining 32 percent of total planned investment.

Annex D—Project Chronology



Legend:

1. Independent cost validation is mandated.
2. EM is updated more frequently to react to fluctuating markets.
3. Working group to streamline approval process is engaged.

Figure 2. Project Chronology. This flowchart depicts the key decision points for the FMF CB Shop Consolidation Project as well as DND controls/improvements that were initiated.

