

This document was produced
by scanning the original publication.

Ce document est le produit d'une
numérisation par balayage
de la publication originale.

A REPORT PREPARED FOR
THE ASSOCIATE DEPUTY MINISTER
ENERGY, MINES AND RESOURCES

PROJECT NUMBER 2-5935

AUGUST 1986

REVIEW OF PROGRAM DELIVERY
SURVEYS AND MAPPING BRANCH, EMR

ANNEX A: DETAILED DESCRIPTION
OF EACH DIVISION

TA 523
.A1
R48
1986
EMRES

SUB-SUB-ACTIVITY	PRODUCTS/SERVICES	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COST ('000)					CLIENTS	INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES
					05/84	06/87	07/88	08/89	09/90						
2. PRIMARY VERTICAL REFERENCE SYSTEM	12.1	Rellevelling & maintenance: Establishment of MVD by the southern component: 1990-92 of the primary vertical reference system	Inputs: - Existing level lines Outputs: - Bench marks	First order levelling is done with sensitive automatic levels and solar rods, usually along travelled routes by one or two 5-man parties. Special sensors are used to read air temperatures and measurements which are recorded automatically on computers. The work is usually contracted. Geodetic Survey has developed a motorized levelling system which improves productivity.	PT 21.9 In-house* 860 Contract 5000 3300 3300 3300 Salary 855 O & M 397 Contract 921 Total 2175 Revenue 0 * Number of kilometers levelled, does not include line kilometers inspected and monumented	Data management group with the control survey users as the end clients	Provincial Surveying and Mapping organizations Canadian Hydrographic Service (tide gauges)	Private sector firms have the expertise and are carrying out this work Some provinces do limited high precision levelling when Geodetic cannot provide timely service. Duplication avoided through good communication (CCSM).	Development of the rapid precision levelling system (RPLS) will speed up levelling but can only be used in certain circumstances. Overall increased output is estimated at 30%. This new system could be available as early as 1988 but may prove too costly for contractors.						
	12.2	Completion of the northern component of the primary vertical reference system To complete 5,000 km. of levelling, 150 - 200 GPS points on existing bench marks and the establishment of 4 tidal gauge stations	Inputs: - Levelling - Geoid Outputs: - Elevations - Bench marks	Northern work frequently has to be done in winter because the terrain is impassable or not firm in summer months. Shidoos and aircraft are then used for transportation.	PT 1.5 In-house* 480 Contract** 150 150 150 Salary 33 O & M 43 Contract 235 Total 333 Revenue 0 * Number of kilometers levelled ** Acceleration of northern network only if extra funding is provided	Data management group with the control survey users as the end clients	All agencies of government with interests in northern development and defence. GPS capabilities are currently being developed by the private sector. When GPS is developed for the establishment of reference elevations it is expected that several private sector firms will have the capability to carry out this work. The private sector has the expertise to carry out high precision levelling but this may require the loan of specialized equipment by Geodetic Survey	Most future levelling work in the north has been stopped until the development stage of GPS has been completed. It is hoped that GPS will be used starting 1988 for the establishment of reference elevations. Cannot proceed with this work until 1990 due to other constraints e.g. MVD.	GPS cannot be used alone. There is a need to establish a basic network of levelled lines. GPS elevations will be limited in orthometric accuracy due to geoid uncertainties. The reduced accuracy will need to be accepted by northern users.						
	12.3	High precision site stability and crustal movement surveys (earth dynamics) To monitor north crustal movements for Earth Physics Branch and other agencies as required. e.g. PMC res Parliament Hill New Brunswick Power res Nictacouc Dam S.C. Government res Besset Dam	Inputs: - Survey points Outputs: - High precision measurements	Similar to 1.5 on the previous page. All measuring procedures are highly refined.	PT 3.3 In-house* 180 200 200 200 Contract - - - - Salary 130 O & M 43 Contract 0 Total 193 Revenue 25 * Number of kilometers levelled ** Only partial O & M is charged, no salaries included	Earth Physics Branch	Earth Physics Branch The private sector has the expertise to carry out high precision levelling. This may require the loan of some specialized equipment by Geodetic Survey When GPS will be used for this work, it is expected that several private sector firms will have the capability to carry out this work.	None. Earth Physics Branch relies on Geodetic Survey for this service. In the past SMB was not able to meet all surveying requests because of budgetary constraints. The advent of GPS will reduce costs and improve the efficiencies of surveying operations. There is however the need to establish GPS measurement confidence limits in comparison to conventional methods for comparative reputation not for absolute values. GPS will open the door to private sector firms to carry out this work.							
3. SUPPLEMENTARY POSITIONAL REFERENCE SYSTEM	13.1	Surveys for the National Mapping Data Base To respond to Topographical Survey plans.	Inputs: - Workplans Outputs: - Survey control points and coordinates and elevations.	Second- and lower-order control, horizontal & vertical, are established by a variety of methods: ISS, Doppler, GPS, EDM traversing etc. Work also includes targetting of ground points for photographs. Parties vary in size from 2 to about 10 persons. Aircrafts are used frequently for displacement. Stations are usually 2 to 10 km apart.	PT 24.5 In-house* 975 300 300 - - Contract - - - 200 200 Salary 1630 O & M 738 Contract 591 Total 2359 Revenue 449 594 from Topo 47 from SMB 8 from EPB * Number of secondary survey stations established - Contract amount includes 63% K for aircraft rental	Topographic Survey	Provincial surveys and mapping organizations. SMB has had bad experiences in contracting out ISS surveying work. Out of 3 contracts let to date results were accepted for 2 contracts but they were below specs and the results from 1 contract were not accepted Problems are mainly due to the lack of reliability of the equipment Contracting Doppler surveys has proven satisfactory	Many provinces conduct similar surveys - duplication is avoided through good communications. It is expected that the Branch will obtain digital mapping information from the provinces in the future and as a result SMB would perhaps assist by conducting supplementary control surveys to facilitate provincial mapping programs. This will result in the availability of provincial mapping data as input into the national mapping data base (agreements with provinces)							
	13.2	Surveys for Federal programs - road controls in the Yukon & NWT - Survey points for settlements in the Yukon and the NWT To establish multipurpose control stations along new roads and in new towns and settlements as development occurs and in response to local needs expressed through liaison committees.	Inputs: - Workplans Outputs: - Survey control points and coordinates and elevations.	Surveys usually involve the establishment of second- and lower-order control along roads and in settlements in the Yukon and NWT. GPS, Doppler, ISS, and EDM traversing methods are used frequently. Parties usually number 4-10 persons and stations are usually 2-10 km apart.	PT - In-house* 0 230 100 70 70 Contract - - - - Salary 0 O & M 0 Contract 0 Total 0 Revenue 0 * Number of secondary survey stations established	Federal agencies, municipalities of the NWT and the Yukon	Liaison Committee for the NWT and the Yukon Legal Surveys Division The private sector has the expertise to carry out this work. None. Limited work done by territorial agencies Liaison committees avoid duplication.	It is expected that these activities will eventually be carried out by the NWT and the Yukon.							
	13.3	Gravity Positioning To respond to the needs of the Geological Survey Branch	Inputs: - Gravity vector survey points Outputs: - Positions and elevations	Determination of position and elevation of gravity vector survey points by ISS methods.	PT 0.8 In-house* 180 270 200 200 200 Contract - - - - Salary 30 O & M 33 Contract 14 Total 77 Revenue 25 From EPB * Number of survey points ** 51% K contract was for aircraft rental	Geological Survey Branch	Geological Survey Branch Problems with private sector skills and equipment if ISS methods used. When GPS is used for this work, it is expected that several private sector firms will have the capability to carry out this work.	None. The advent of GPS will reduce costs and improve the efficiencies of surveying operations. In addition this will open the door to private sector firms to carry out this work.							

SUB-SUB-ACTIVITY	PRODUCTS/SERVICES	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COST ('000)					CLIENTS	INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES
					85/86	86/87	87/88	88/89	89/90						
4. GEODETIC INFORMATION	14.1 Data Analysis & Adjustment	To complete computations for an integrated National Horizontal Control Network in cooperation with the provinces by 1987.	Inputs: -Horizontal control data -Computer programs and adjustment methods Outputs: -Adjusted horizontal control points, confidence regions and covariance matrices	Data processing involving the use of sophisticated least square adjustment methods to produce "best fit" horizontal positions on a new datum. This process also involves data extraction from records and conversion to computer readable form. Several 100,000 provincial points must be integrated by the provinces with the assistance of Geodetic Survey (a major undertaking)	PY 10.8 In-house* 1700 Contract - Salary 365 O & R 130 Contract 0 Total 495 Revenue 0 * Number of secondary stations integrated	1700 22000 15000 -	The provinces will be given the information they want. Users will access horizontal control information through the Geodetic Survey data bank.	Canadian Control Survey Committee with representation from all provinces (CCSC). This committee has been in existence for the past 4 to 5 years. United States National Geodetic Survey.	Many private sector firms can do routine computations but only 2 or 3 firms can perform large scale computational adjustments; however the complexity of the liaisons with the provinces would be problematic.	Duplication with the provinces is minimal because cooperation with the provinces has been ongoing for several years particularly through CCSC.	This activity is tapering off and will be completed by 1987. Wearing the completion of this activity, resources will be transferred to NAVD 88. There will however be a need to keep a small staff to integrate new data into the network. These resources will eventually be moved to the Data Base Management Group. Data extraction will be contracted out in 86-87, estimated value approx. \$150 K	Certain computational methods are being developed (software) by Systems Development, the provinces, and the industry. Staff transfers to NAVD 88			
	- NAVD 88 advance preparation of the new North American Vertical Datum	To complete adjustment of the Primary Vertical Control Network on a new datum by 1992.	Inputs: -Vertical control data -Computer program and adjustment methods Outputs: -Adjusted vertical control points	Similar to the above except that elevation data is being handled exclusively. Emphasis at present is on converting boot data to computer-readable form. Studies are being carried out to determine and remove the effects of field systematic errors. All work is done in-house.	PY 17 In-house* Contract Salary 580 O & R 132 Contract 0 Total 712 Revenue 0	OUTPUTS NOT READILY QUANTIFIABLE	Users will access vertical control information through the Geodetic Survey data bank.	The provinces are currently involved to a limited extent in the adjustment process but will become more involved as lower-order points are integrated. They will be involved through the Canadian Control Survey Committee above.	Several firms have the capabilities of doing the computations, however, the complexity of the liaisons with the provinces would be problematic.	Future liaison with the provinces will minimize possible duplication. Again, CCSC will play an important role.	To complete the initial adjustments by 1990 and integrate the lower order levels by 1992. To add the NAVD83 resources to NAVD group upon completion of NAVD83.	Staff re-assignment in 1992.			
	- Integration of field surveys into the national networks (horizontal and vertical) and performing special computations for government and industry	Integration of field surveys To provide checking and advisory services to Topographical Survey on an as required basis. To provide technical and advisory services to government and industry on an as required basis.	Inputs: -Horizontal and vertical field survey data Outputs: -Horizontal and vertical field survey data integrated into the networks -Input for the planning of vertical resurveys	The work currently being done involves: -Data automation -Data analysis including investigation of errors -Computations All work is done in-house	PY 8.4 In-house Contract Salary 285 O & R 75 Contract 0 Total 360 Revenue 0	OUTPUTS NOT READILY QUANTIFIABLE	Data Services Section, Topographical Survey	Provincial surveying and mapping organizations when their data is used or affected. Similarly, the Canadian Hydrographic Service and the Mapping and Charting Establishment of DND.	Several firms have the capability of doing integration computations. The need to make numerous judgments during the process and to refer frequently to in-house records could prove onerous for contractors. Responsibility for the quality of computed results, within standards may make contracting impractical.	Should be very little - future liaison with provinces will assist.	Integration process will become more automatic - less need for individual judgment				
14.2 Data Services	- Data base development	To produce a fully automated interactive vertical and horizontal control database which can communicate with provincial data bases by 1990.	Inputs: -Adjusted horizontal control data -Adjusted vertical control data Outputs: -Fully automated Data Base	Software development and data automation	PY 1.9 In-house Contract Salary 60 O & R 20 Contract 0 Total 80 Revenue 0	OUTPUTS NOT READILY QUANTIFIABLE	Not Applicable	Canadian Control Survey Committee	Specific software development packages could be contracted (and have been). Overall coordination of development needs to remain in-house.	Future liaison with the provinces will minimize possible duplication. CCSC will play an important role.	New technologies may force reconsideration of some design features.	Standardization of data nomenclature needs to be carried out if the federal and provincial data bases are to be interactive. LRIS has already established a very good database but incompatibilities with the federal data base may preclude automated data exchange.			
	- Automation of data, maintenance of records and requests	-To maintain and update the federal data base containing primary horizontal and vertical data and SMD project specific provincial data -To provide primary vertical and horizontal data and Territorial geodetic data to users	Inputs: -Adjusted horizontal control data -Adjusted vertical control data Outputs: -Fully automated data base	Keeping the present interim automated data base and annual records updated by entering new or revised data.	PY 14 In-house* 4000 Contract - Salary 440 O & R 111 Contract 0 Total 551 Revenue 0 * Number of requests processed	4000 4000 4000 4000 4000	Surveyors, engineers, hydrologists - pricing policy	-All provinces -Legal Surveys Division (for Yukon and the NWT) -Canadian Hydrographic Service -DND	Several companies have expressed interest in maintaining regional components of the federal data base.	Minimal - good liaison with the provinces through CCSC.	Future plans are to develop and maintain a distributed data base with the provinces, including automated integration of new surveys to augment the system data.				
14.3 Publications	-Technical manuals control survey specs, field instructions etc. -Research reports: survey adjustments, speed refinement GPS etc. -Quad booklets 451 booklets for all Canada each covers 1 degree square -Control survey information Card index with descrip. horizontal control points & data bank for positional information.	Technical manuals: To convey survey standards to the surveying community Research reports: To provide a targeted audience with research info on specific topics Quad booklets: To provide surveyors with values & descriptions of BMs Control survey information: To provide users with positioning and written descriptions of control survey stations	Technical manuals: Writing, editing (in-house) printing (photocopy) Research reports: Technical expertise in-house Industry & Universities Quad booklets: Vertical survey information Control survey information: Horizontal Survey information	Technical manuals: Writing, editing (in-house) printing (photocopy) Research reports: Writing, editing (in-house & by contract) and prepared (in-house) Quad booklets: Prepared & printed in-house Control survey information: Prepared & printed in-house	PY In-house Contract Salary O & R Contract Total Revenue IN TRANSITION		Technical manuals: Surveying community on request Research reports: Interested individuals/ organizations (world wide surveying community) mailing list of 300-400 Quad booklets: Surveyors, etc. Control survey info: Surveyors etc.	Technical manuals: Internal Research reports: Internal Quad booklets: None Control survey info: None	Technical manuals: N/A Research reports: little required - essentially a growing process Quad booklets: None Control survey info: None, Geodetic mandate is recognized	Technical manuals: None Research reports: None Quad booklets: None, Geodetic mandate is recognized Control survey info: None, Geodetic mandate is recognized	Technical manuals: To continue using three manuals to promote standards Research reports: None Quad booklets: To discontinue when info is accessible from data base 1990 Control survey info: To discontinue when info is accessible from data base 1990 (annual issue)				

SUB-SUB-ACTIVITY	PRODUCTS/SERVICES	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COSTS ('000)					CLIENTS	INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES
					85/86	86/87	87/88	88/89	89/90						
5. SYSTEMS DEVELOPMENT	5.1 GPS	To establish a multi purpose positional system by: -establishing Canadian satellite tracking capabilities by 1989 -automated tracking stations (4) -central processing facility -establish an active control system (approx. 20 stations) by 1991. -Develop software for pre and post-processing of GPS data.	Inputs: -System development -System set-up -Software development Outputs: -Positional system -Data for position computation -Software	-Development of methodology data manipulation and software development for post-processing computations -adjustment computations -orbital improvement computations (joint contracts - universities and industry) -Requirements study for active control stations and tracking stations (in-house) only beginning -Hardware acquisition	PT 18.1 In house CONTRACT NOT READILY QUANTIFIABLE Salary 720 O & R 188 Contract 262 Total 1170 Revenue 0	-Industry -Governments -DGOs -UBC -Laval -Government -Geodetic Survey -Geological Survey -Transport (Coast Guard) -Environment (Hydrographic S) -Dept. of Communications -Provincial Survey & Mapping Agencies.	National working group on GPS applications in Canada (under MACSN) -Industry -Horlath -Canadian Industries Surveys -Universities -JRC -Laval -Government -Geodetic Survey -Geological Survey -Transport (Coast Guard) -Environment (Hydrographic S) -Dept. of Communications -Provincial Survey & Mapping Agencies.	Methodology is currently being developed jointly with industry. Development of active control points will be done jointly with industry. Management of active control points could be done competitively by industry. Philosophy is what can be done by industry should be done by industry. Private sector has software development skills. Industry focus is primarily on practical applications of GPS, not on research.	There is an opportunity to share tracking and control sites with DGOs: -Environment Canada -Weather stations -Transport Canada Provinces will most likely be involved in the financing of active control points Impact on current primary networks: -Existing horizontal network will need to be resurveyed -Horizontal and vertical networks should be nested where GPS measurements were taken.	T.B. submission for equipment and development to be prepared soon. The impact of this new technology will be far reaching as all surveys will be automatically referenced to a uniform Canadian coordinate system. Impact on current primary networks: -Existing horizontal network will need to be resurveyed -Horizontal and vertical networks should be nested where GPS measurements were taken.	What form should provincial participation take in the establishment of the positioning system. (financial and other) There is a need for a good study on the implementation of GPS (currently being carried out) User requirements need to be defined on accuracy requirements of GPS. This will allow identification of the extent of network upgrading required. Because of GPS, much of the network has to be redone over the next 10 years.				
	5.2 Geoid refinement	To develop the Geoid accuracy to a level which can allow the calculation of orthometric heights (heights above mean sea level) by 1990/93	Inputs: -Gravity modelling -Elevations from leveling -Digital elevation model -Deflections of the vertical -Processing software Outputs: -Accurate geoidal undulations	-Gravity modelling supplied by Geological Survey -Elevations from Geodetic -Digital elevation model from Topo and the U.S. defence department -GPS measurements by Geodetic (to be carried out)		Data base and users	-Topographic Survey -U.S. Department of Defense -Geological Survey -Universities	None, and full advantage of developments in other countries is taken into consideration.	To use GPS for calculations of elevations as well as coordinates. GPS will have a significant cost reduction impact on elevation survey costs.	Lack of availability Digital terrain elevations. There is a need to develop an implementation plan for the establishment of GPS points on benchmarks across Canada.					
	5.3 Data base systems development	To implement a distributed data base system for geodetic data in which the Federal and Provincial systems are the base nodes.	Inputs: -Canadian Control Survey -Committee member participation -In-house learning and design Outputs: -Distributed data base system -Policy for data management strategy	Conceptual development of the data base system which includes: -reliability of data -numeric information -Spatial information -Videotext Development of standards Selection of software		-Working committee of the Canadian Council of Surveys and Mappings -Geodetic Survey -Hydrographic Survey -all provinces	Need assistance of private sector consultants in the area of data management systems. Data automation can be carried out by industry	No duplication as there is cooperation with the provinces	-Development of standards -Automation of data -Purchasing of equipment	No formal SRB decision on the structure of the data base. The Branch needs to establish GPS user requirements re: accuracy of data.					
	5.4 VLB	To provide a very precise anchor network for the GPS networks across Canada. This anchor network will permit the control of GPS errors	Inputs: -Develop methodologies and software. -Hardware development and acquisition. Outputs: -VLB stations -3 or 4 fixed antennas -1 mobile station	Major developmental work to be carried out by universities and industry with some development carried out in-house		All users of GPS	-Universities for research -Industry for the development of hardware -Provincial Surveying Mapping Agencies -Geological Survey is making a submission to T.B. for the establishment of fixed antenna stations	Good expertise in the development of hardware.	None	It is hoped that VLB can be implemented over the next 5 to 7 years. Numerous benefits will be derived from having a single multi-purpose reliable coordinate system across Canada.	Geodetic Survey T.B. submission for mobile antennas (I) has received Cabinet approval. Now awaiting T.B. project approval. This project is dependent on Geological Survey obtaining funding for fixed antenna stations. Establishment of a Technology Centre for the development of VLB offers many advantages and is being considered.				
	5.5 M008	To develop mathematical models and software to perform major computational effort. To develop methods for integration adjustments.	Inputs: -Research and development of models in cooperation with the U.S. National Geodetic Survey Outputs: -Mathematical models	Conduct R & D		The Beta Management Group who carry out the computational adjustments	-U.S. NSB -Discussions with the provinces through the Canadian Control Survey Committee re network integration methodology	Minimal at the moment but industry is developing computational capability.	None	To complete the project including secondary integration by 1990.					
	5.6 M4008	To develop mathematical models and software to perform major computational effort. To develop methods for secondary integration adjustments.	Inputs: -Research and development of software in cooperation with the U.S. National Geodetic Survey Outputs: -Mathematical models	Conduct R & D		The Beta Management Group who carry out the computational adjustments	-U.S. NSB -Discussions with the provinces through the Canadian Control Survey Committee re network integration methodology	Minimal at the moment but industry is getting involved	None	To complete the project including secondary integration, by 1995.					

A.2
SURVEYS AND MAPPING BRANCH
TOPOGRAPHICAL SURVEY DIVISION - CURRENT SITUATION

SUB-SUB-ACTIVITY	PRODUCTS/SERVICES	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COSTS (\$'000)					CLIENTS	INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES
					85/86	86/87	87/88	88/89	89/90						
1. AERIAL SURVEY DATA BASE (ASDB)	1.1 Air Photography	- Photography for new 1:50,000 mapping to be completed by 1989. - Photography for the revision and recompilation of 1:50,000 maps needs to be completed on an as required basis. (approx. 300 maps per year). Note: By an Order in Council, SNB assumes funding and PAs for interdepartmental Committee on Aerial Surveys (ICAS) secretariat (3-4 PAs).	Inputs: - Plans & priorities by the Planning & Data acquisition section - Preparation of contract specifications - Quality Control Outputs: - Aerial photographs	- Identification of areas where photography is needed (reote) seeing imagery change detection, known inadequacies - Specifications prepared - Flight planning - Contracting through ICAS	PT 1.3 In-house Contract 22,600 Salary 54.6 O & M 12.6 Contract 550.0 Capital 0 Total 617.2 Revenue 0 * Line kilometers	-Users including industry, governments and the public, -Internal to Topographic Survey -Distributed through the Air photo library (RD & D)	-Provinces to eliminate duplication - ICAS - OSS for Contracting	Excellent capabilities, many sources, very competitive business All photography is contracted out	Little duplication with lower level photography taken by provinces because the use of this photography would result in an increased number of photos used for mapping and increased associated set-up time.	New satellite technology (remote sensing imagery) may greatly reduce the need for 1:50,000 photography. This could occur within the next 5 years. See Long Term Plan 1985-91 (This will be a decreasing requirement)	Federal mapping priorities are different from the provinces but studies are now being carried out to determine feasibility and extent of data exchange between Topographic Survey and the provinces.				
	1.2 Field Control Data	- Field Control for new mapping to be completed by 1989. - To establish new field control points for existing 1:50,000 maps which are to be recompiled. This is subject to the recompilation plans (approx. 75 maps per year)	Inputs: - Plans & priorities by the Planning & Data acquisition section - Geodetic Survey data from in-house industry, the provinces, DMB, etc. Outputs: - Field input data required for aerotriangulation	- Contact Geodetic Survey Division to identify and analyse existing controls - Identify new control requirements. - Request Geodetic Survey to establish controls. - Check and verify information provided by Geodetic Survey	PT 4.3 In-house Contract 146 Salary 146 O & M 21 Contract 394 Capital 0 Total 761 Revenue 0	-Internal to Topographic Survey -Geodetic Survey Division -DMB (training)		See Geodetic Survey matrix	See Geodetic Survey matrix	See Geodetic Survey matrix (this will be a decreasing requirement)	Reallocation of staff currently carrying out this work.				
	1.3 Aerotriangulation	- To complete aerotriangulation of unmaped areas (1:50,000) by 1989 - To complete aerotriangulation for the recompilation of 1:50,000 maps to be digitized involving 1800 maps. Some of these will be done by the provinces. - To carry out periodic maintenance on as as required basis	Inputs: - Aerial photography - Geodetic field control data Outputs: (A.S.D.B.) - Sets of photographs with photogrammetric ground control. - Supporting computer printouts and mag tapes	- Control point identification - Orientation of photographs - Photogrammetric measurement - Indexing and storing of aerotriangulation - Provide aerotriangulation data at client's request	PT 21.3 In-house Contract 9000 Salary 739 O & M 174 Contract 0 Capital 0 Total 913 Revenue 0 * 9000 models which represent 450 maps Note: 2 Photographs per model	-Internal to Topographic Survey -CCRS	-Geodetic Survey Division -DMB (training) -Provinces -Industry -ODs	Good capabilities but using the private sector may not be economical because of low volumes -judgmental decisions required in the course of the project -Difficult to write specifications	None	Once aerotriangulation has been completed for new and revision mapping, only maintenance will be needed. This will require 3-4 PAs. Approximately 1500 maps in southern Canada need recompilation. Further investigation and greater accuracy requirements may necessitate additional work. New data management filing & retrieval techniques will be developed over the next 3 years. This will reduce workload requirements in this area.	Areas in Canada where acceptable aerial photographs and ground control do not exist may have an impact on aerotriangulation requirements. These requirements still need to be quantified. Maintenance of the aerotriangulation system will require much less staff than currently employed. As a result a downsizing plan will be required. Classification of data in the data base needs to be revised to identify information which does not meet acceptable accuracy standards.				

A.2 (CONT.)
SURVEYS AND MAPPING BRANCH
TOPOGRAPHICAL SURVEY DIVISION - CURRENT SITUATION

SUB-SUB-ACTIVITY	ACTIVITIES	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COSTS ('000)					CLIENTS	INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES
					85/86	86/87	87/88	88/89	89/90						
2. REVISION MAPPING (1:250,000)	2.1 Revisions using updated 1:50,000 maps (annual process)	To be carried out on an ongoing basis. The current annual process will eventually be carried out digitally.	Inputs: -Updated 1:50,000 maps -Toponymy data -Resource Centre data -Reproduction material Outputs: -Revised reproduction material	Annual transfer of information (addition or deletion) from 1:50,000 maps to 1:250,000 reprint.	PY 7.5 In-house* 13 RCE* 16 Salary 252 O & H 18 Contract 0 Capital 0 ----- Total 270 Revenue 0	85/86 86/87 87/88 88/89 89/90	Process expected to cease by 89/90	Reproduction and Distribution Division	-Reproduction and Distribution Division -DND (NCE) training	Industry has the capability to carry out this work. However there are difficulties in developing specifications because it is very difficult to determine the amount of work to be carried out.	No duplication	The digitization of 1:250,000 maps will be completed by 1989. At that time most maps will be updated digitally. However, some annual revisions will still be required. Digital updating methodology and software currently being developed. This may take up to 5 years depending on the availability of resources.	There is a need to determine how digital updating of maps will be incorporated in the current data management practices. Impact of MAD 83 on map coordinates		
	2.2 Derivation of maps from existing 1:50,000 maps (complete redrawing of maps, annual process)	To be carried out on an ongoing basis. The current annual process will eventually be carried out digitally.	Inputs: -Updated 1:50,000 maps -Toponymy data -Resource Centre data -Reproduction material Outputs: -Revised reproduction material	Photographic reduction of 1:50,000 reprint to 1:250,000 and scribing to produce 1:250,000 reprint.	PY 12.5 In-house* 0 Contract* 33 Salary 412.5 O & H 28.0 Contract 46.0 Capital ----- Total 486.5 Revenue 0	85/86 86/87 87/88 88/89 89/90	Process expected to cease by 89/90	Reproduction and Distribution Division	-Reproduction and Distribution Division	The first derivation contract was issued last year. The results were satisfactory. Industry has the capability to carry out this work	No duplication	When all 1:250,000 maps are in digital form and meet the required accuracy standards, the current annual derivation process will cease to exist.	Derivation is a problem when 1:50,000 map blocks are in metric and in feet. Procedures to deal with this situation need to be developed. There is a need to determine how digital updating of maps will be incorporated in the current data management practices.		
	2.3 Revisions using Remote Sensing Imagery	-Updating of 1:250,000 maps in conjunction with the map revision program -To detect change areas for existing 1:50,000 maps, in conjunction with the map revision program.	Inputs: -Plans & priorities by the Planning & Data acquisition section -Preparation of contract specifications -Resource Centre data -Quality Control -Reproduction material Outputs: -Detection of change 1:50,000 -Plastic overlays 1:250,000	-Prepare contract for change detection and revision -Monitor contract and accept deliverable -Modify reprint Note: some work done in-house comparing remote sensing imagery to existing maps to detect and annotate change	PY 0.7 In-house* ----- Contract* 605 Salary 23.6 O & H 4.0 Contract 236.0 Capital ----- Total 263.6 Revenue -----	85/86 86/87 87/88 88/89 89/90	Contracting will continue	Reproduction and Distribution Division	-RCS -Reproduction and Distribution Division	-Only two firms currently have this capability in Canada. Only 2 firms out of 21 firms who answered a recent proposal call have qualified. However, it is expected that industry capabilities in this area will increase as provinces contract out this type of work.	With the exception of Ontario who have tried this process for their 1:250,000 maps, none of the provinces have used this technique.	New high resolution Remote Sensing Imagery and large format cameras (space shuttle) could serve as a major input for the revision of 1:250,000 and 1:50,000 maps. This would reduce considerably the need for aerial photography. This new technology may be available in 3 to 5 years. Costs and feasibility of using this new technology needs to be determined.	Need to develop procedures to update digital data from Remote Sensing Imagery. Raster technology needs to be investigated and developed. Costs and feasibility of using Remote sensing technology (instead of aerial photographs) needs to be investigated.		
	2.4 Maps produced from digital data (Continuation of Activity 4.1 on next page)	To produce maps from digital with a minimum of human intervention	Inputs: -Digital data Outputs: -Reprint	To be developed Essentially this process will consist of generalizing digital data base information, updating this information, plotting and producing reprint	PY ----- In-house* ----- Contract ----- Salary ----- O & H ----- Contract ----- Capital ----- ----- Total ----- Revenue -----	85/86 86/87 87/88 88/89 89/90	DIGITAL MAP REVISION AND ASSOCIATED MAP PRODUCTION ARE NOT EXPECTED TO BEGIN UNTIL 1990	Reproduction and Distribution Division	-RD & D -Provinces -Industry	Industry potentially has the capability of producing reprint from massaged digital data.	None	Need to further develop Raster plotting technology. Software development	Much developmental work is required to: -be able to generalise digital data -Completely automate plotting...		

4.2 (CONT.)
SURVEYS AND MAPPING BRANCH
TOPOGRAPHICAL SURVEY DIVISION - CURRENT SITUATION

SUB-SUB-ACTIVITY	PRODUCTS/SERVICES	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COSTS ('000)					CLIENTS	INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES
					85/86	86/87	87/88	88/89	89/90						
3. NEW & REVISION MAPPING (1:50,000)	3.1 New mapping	To complete the coverage of Canada by 1995. Currently 10,400 maps out of 12,922 maps have been completed.				PT 18.3									
	-Monochrome maps (analogue)	To carry out monochrome mapping in the north only	Inputs: -Aerial photographs -Aerotriangulation data -Toponymy data -Ancillary information (boundaries, road class, etc.) Outputs: -Reproduction materials	Prepare contract, monitor, review quality and approve -Stereoplotting -Scribing -Meditation of administrative boundaries etc.		In-house* 4 Contract* 152 Salary 414 O & R 41.7 Contract 1235 Capital 0 Total 1912.7 Revenue * Number of maps produced	IN-HOUSE PRODUCTION TO INCREASE 80 80 80 80	Reproduction and Distribution Division	-R & B (photochemical services) -Municipalities -Provinces -SSB (Toponymy) -OGDs	There are approximately 32 firms that can do this type of work. Private sector capabilities are good in this area. All work is now done by contract with industry.	None	Future short term plans involve shifting contracting work to 1:50,000 digital recapitulation (southern Canada) to develop greater private sector capabilities. Monochrome mapping would be done at a slower rate by contract or in-house.	MAP 83 will result in a shift in coordinates. It has not yet been decided how this will be shown on 1:50,000 maps.		
	-Monochrome maps (maps produced from digital data) (continuation of Activity 4.2 on next page)	To carry out monochrome mapping in the north only and to develop private sector expertise in digital mapping. To develop industry capabilities in digital mapping.	Inputs: -Digital Data -Toponymy data Outputs: -Reproduction materials	-Start with digital positional files -Produce cartographic files using batch processing and manual means (BOL automatic) -Produce plot file -Automatic plotting -Manual interventions -names -toponymy -symbols		PT 5 In-house* 81 Contract* 0 Salary 148.5 O & R 14.8 Contract 441.9 Capital 0 Total 827.2 Revenue * Number of maps produced	ACTIVITY TO TERMINATE IN 86/87	Reproduction and Distribution Division	-R & B (photochemical services)	Good, all mapping is now done by the private sector There are approximately 10 firms that can do this type of work.	None	Future short term plans involve shifting contracting work to 1:50,000 digital recapitulation (southern Canada) to develop greater private sector capabilities. No more digital monochrome mapping foreseen over the next few years. Resources are being shifted to digital map recapitulation in southern Canada.	The management of digital data		
	-Photomaps	To complete the photomapping operations in northern Ontario. To respond to special requirements as they arise.	Inputs: -Aerial photographs -Aerotriangulation -Toponymy data Outputs: -Orthophotos -Photomaps -Digital terrain model data	Use of Gestalt mapper to produce photomaps and digital terrain data. Photomaps are mainly produced for flat areas where topographical features would not be captured as well on ordinary maps.		PT 9.5 In-house* 25 Contract* 39 Salary 374 O & R 37.5 Contract 579.4 Capital 0 Total 990.9 Revenue * Number of maps produced Includes the production of digital elevation models	ACTIVITY TO TERMINATE BY 1989	Ontario has asked SHD to do photomapping of southern James Bay Geologists who use this info. as a map supplement DIAND through Legal Surveys for the mapping of Indian reserves Clients for Digital Terrain models have yet to be defined Environment Canada	-R & B (photochemical services)	The ability to produce photomaps is relatively flat area is held by 4 to 5 companies. As industry may not necessarily keep this capability, SHD has decided to maintain this capability in-house.	None	Tentative plans are to complete photomapping in the area of SH of Hudson Bay as requested by Ontario. This will serve as basic mapping for the foreseeable future. In other areas line mapping will prevail. Completed photomaps will serve as map supplements.	Unclear demand for this product. Must ascertain if users are satisfied with this product or if they would prefer monochrome maps. Initially it was thought that photomaps would be significantly cheaper than monochrome maps and on this basis it was decided to produce these maps. This has not been demonstrated to be the case as photo maps cost approximately the same price to produce as monochrome maps. In the past photomaps were thought to have potential as base mapping for northern Canada. As a result the future of photomapping is being reconsidered.		
	3.2 Map revision					PT 56.9									
	-Manual revision	To continue manual revision another 10 years. After this period it is expected that the digital database will be extensive enough to make it practical to revise all maps digitally.	Inputs: -Aerial photographs -Aerotriangulation -Toponymy data Outputs: -Revised reproduction material	Revise maps by updating the existing reprint on the basis of new aerial photographs flown for this purpose. All this work is currently done in-house.		In-house* 373 Contract* 25 Salary 1917.4 O & R 286.4 Contract 76.4 Capital 0 Total 2274.4 Revenue * Number of maps produced ** Only scribing is contracted	TO CONTINUE	Reproduction and Distribution Division	-R & B (photochemical services)	Private sector skills are good for the carrying out of the following discrete tasks: -scribing -names & format -photochemical work Because of the variable nature of the revision process contracting out is problematic At the moment only scribing is contracted.	None	Eventually all maps will be revised from an updated digital data base The use of RS and perhaps raster technology will be developed for this purpose.	The current revision process employs 37 Pts and as a result retraining will be required to reallocate the current personnel. There is a need to develop a training plan designed primarily to convert technical staff engaged in manual map revision to functions associated with data management.		
	-Digital recapitulation (map production only) (essentially the same as new mapping - recompiling from new photography) (continuation of Activity 4.3 on next page)	To revise 1500 maps of southern Canada by 1996.	Inputs: -Digital Data -Toponymy data Outputs: -New reproduction materials	-Start with digital positional files -Produce cartographic files using batch processing and manual means (BOL automatic) -Produce plot file -Automatic plotting -Manual interventions -names -toponymy -symbols		PT 14 In-house* 27 Contract* 0 Salary 471.8 O & R 213.5 Contract 0 Capital 0 Total 685.3 Revenue * Number of maps produced	CONTRACT PRODUCTION TO INCREASE SIGNIFICANTLY	Reproduction and Distribution Division	-R & B (photochemical services)	In principle the private sector has the expertise to carry out this work. Three test contracts have been let out to produce a digital file and map. Some of the results have proven successful. Industry is keenly interested in developing its skills in this area.	None	To streamline the process to make it more cost effective Currently the production of maps from digital data costs as much as the costs of producing digital data. More developmental work is needed to assist human intervention in the production of maps.	Some technical problems need to be resolved e.g. updating of data files, management of the data base.		

A.2 (CONT.)
SURVEYS AND MAPPING BRANCH
TOPOGRAPHICAL SURVEY DIVISION - CURRENT SITUATION

SUB-SUB-ACTIVITY	PRODUCTS/SERVICES	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COSTS (\$'000)					CLIENTS	INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES
					85/86	86/87	87/88	88/89	89/90						
5. SPECIAL PROJECTS	5.5 Production of Special Maps	- To prepare special maps on an as required basis	Inputs: - Planning Outputs: - Reprint for index maps etc.	- Preparation of the reprint at the required scale	PY 3 In-house* 21 Contract Salary 101 O & M 4 Contract Capital Total 105 Revenue 0 * Number of maps produced	PRODUCTION TO CONTINUE ON AN AS REQUIRED BASIS	- Geographical Services		Private sector capabilities in this field are good	None		To continue the production of special maps on an as required basis			
	5.2 Specialized services in support of new and revised mapping	- To provide services on an as required basis	Inputs: - Work requests - Program planning Outputs: - Secretariat ICAS - Monitoring and inspection of contracts (CIDA & OGDs) - Projects for other divisions	- Secretariat ICAS - Contract management and quality control	PY 24.2 In-house Contract Salary 877.2 O & M 56.5 Contract Capital Total 933.7 Revenue* 260 * Full costs recovered	TO CONTINUE AT CURRENT LEVEL OF ACTION	- ICAS - CIDA - OGDs	- ICAS - CIDA - Other OGDs - Other SMB divisions	Special mapping contracts carried out by the private sector	None		To continue to provide this service on a full cost recovery basis			

A.3
SURVEYS AND MAPPING BRANCH
GEOGRAPHICAL SERVICES-CURRENT SITUATION

PRODUCT/SERVICE (Activity)	OUTPUTS (Description)	PROCESS (Includes inputs & interfaces)	LONG TERM OBJECTIVES	ESD BUDGET(1)				CLIENTS	DISTRIBUTION CHANNEL	COMPETITORS	VOL (1,000)	REV \$ (1,000)	PRIVATE SECTOR CAPACITY	FUTURE PLANS IMPACT OF TECHNOLOGY	NEW CAPITAL (Capital \$ GM/yr)
				PY	SAL	OPER	CONTR								
NATIONAL ATLAS -Thematic Research	Response to Geographic Info	Inputs: Data collected from ENR and OGD's. Interface: OGD's and National Advisory Committee to determine priorities; Inter-Agency Committee to co-ordinate development of Geographic data bases.	Collect information on maps, research, compilation of 1:250,000 scale maps	0.2	7.1	0	0	0.0	National Atlas Internal	N.A.	N.A.	N.A.	Can do research and provide tabular and text data as input into fair drawings	Digitize data bank to provide lesser revision and more flexible outputs; experimental work station in place; system acquisition by 1990.	
	Input/Map Sheets to National Atlas	Map sheets 1:250,000 scale	100 titles by 1990	12.0	425.7	11.3	117	4.0					Can draft maps according to specifications provided by ESD, many sources	more resources will be required to develop, input and maintain data bank.	
-Cartography	Map sheets	Cartography, Photo-mechanical, compilation at 1:7,500 scale	144 titles available (in atlas)	19.5	691.7	91.7	0	34.1	Education, Gov't, Industry, CND, Gen'l public	SSC	SSC	SSC	Can draft maps according to specifications provided by ESD, many sources	computer assisted cartography	
	1-folio edition	concess/printing and distribution							OGD's				4th edition published and distributed		2000 200
GENERAL CARTOGRAPHIC SERVICES	Support to ENR & OGD's	Management of mapping projects	Continue to serve clients	2.0	70.9	0.8	0	3.1	ENR, OGD's	Direct to client	Private sector except for stat. limitations and confidentiality.	61.5	Possibly could provide similar services but would have less access to base maps.		
	Special purpose maps	Compilation, drafting, photo-mechanical, editing, printing	Revise 69 1:75,000 scale maps by 1992	2.0	71	9	101	3.2	Education, Gov't, Industry, Public				Can prepare maps.		
				4.0	141.9	17.8	101	4.3							
GEOGRAPHICAL NAMES	Secretariat to CPCGN	Interface: Canadian Permanent Committee on Geographical Names (CPCGN)	Receive data from provinces, edit and enter into data base	7.0	248.3	30.8	9	3.4	CPCGN, OGD's	Direct	Can compile names	n.a.	n.a.	Further develop toponymic data base; replace present system	
	Topog. Names Publications	3		1.0	35.5	4.4	5	1.4	Toponymists	SHB	n.a.	n.a.			
-Nonclassification Services	GIS name manuscripts	Using data base prepare lists of geographical names by specific areas and locations		5.0	177.3	22	0	1.4	Topographic Division	Internal					
	Canada Gazetteer Atlas	1:250,000 scale	compile, draft, typeset, photo-produce and publish 2nd edition by 1990	1	33.5	4.4	20	1.4	Education, Gov't, Industry, Public	SSC	N.A.		Can compile, typeset, draft maps and print.		
Canada Gazetteer Series	Provincial Gazetteers	1-27 year	compile, typeset, print 31 gazetteers by 1990	1	39	4.6	116	1.4	Province, Libraries	SSC	N.A.		Can compile, typeset, draft and print names.		
IFR CHARTS AND PUBLICATIONS	See table 2	240	OND and TC outline operational requirements and provide changes/additions to air information	28.4	961	91	495	640	Pilot/civilian/CFPB (land defence), Air traffic controllers, Air administrators	Jeggsen provides CP, AC produce their own			Typeset high volume text data (CFB)	Acquire remainder of system for production by Mar. 1987.	
			Coordination through Interdepartmental Committee on Nautical Charting (ICAC); other committees for defence and civilian standards										Establish digital database, provide training, develop applications software	new digital technology in airplane cockpit will create issue demand for digital navigational data.	
VFR CHARTS AND PUBLICATIONS	See table 3	103	10s for IFR charts	38.4	1300	132	54	662	See as IFR	CND, CFPD			See for IFR		450 125-200
			replace 218 Canada Pilotage Charts with 52 Vnc Charts by 1989. 27 VNC Charts are now available. revise VNC Charts in southern regions yearly												
SYSTEMS DEVELOPMENT	-Aerocharts			5.5	188.6	-	-	-					See above		
	-National Atlas Information System			5.9	218.1	30	-	-							
DIVISION MANAGEMENT				9.0	316	190	-	-							
DIVISION TOTALS				1128.5	4445	489	917	1376							

NOTES:
1) PY & OGD Budget data includes divisional overhead (approximately 7%) for National Atlas, Cartographic Services and Geographical names. National Atlas budget includes 5.9 PPs for systems development.
2) No actual cost data was available for 1985/86 at time of study.
3) N.A. - not applicable
N.N. - not known

A.4
SURVEYS AND MAPPING BRANCH
LEGAL SURVEY DIVISION-CURRENT SITUATION

PRODUCT/SERVICE:	ACTIVITIES/PROCESS	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COSTS					MARKETING		INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES
					85/86	86/87	87/88	88/89	89/90	CLIENTS	DISTRIBUTION CHANNEL					
CANADA LANDS SURVEYING	Board of Examiners	To develop and maintain survey standards and procedures for information derived from legal surveys on Canada Lands and to preserve the integrity of the survey framework on those lands	INPUTS: Training and examination of surveyor candidates OUTPUTS: Commissioning of surveyors	Examination and commissioning of candidates as Canada Lands Surveyors (CLS's)	PY 1.5 In-House 1.5 Contract NIL In-House (\$) Contract (\$) Capital (\$) Total Revenue						Private individuals Association of Canada Lands Surveyors		None		Long term plan to shift the Canada Lands Surveyors profession to a self-regulatory body as is the case with the provincial land surveyors	
	Management of Surveys	To manage the surveys and mapping required on Canada Lands in response to demands from the agencies responsible for the administration and control of those lands	INPUTS: Records OUTPUTS (1985/86): Investigating approx. 900 requests for surveys of Canada Lands and managing and regulating the resultant surveys Managing a property mapping program for 2300 Indian Reserves for DIAND 1050 Regional survey plans 2050 plans examined 737 base maps	Regulation (standards) Advice and consultation Instructions Direct surveys Plans examination Base mapping Inspections	PY 89 In-House 89 Contract TOTAL BUDGET FOR LSD In-House (\$) 5706K Contract (\$) Capital (\$) 90K Total 5796K Revenue N/A OGD funding for execution of surveys is approximately \$2 million, mainly from the Department of Indian Affairs and Northern Development			Other SMD divisions OGDs Provinces and Territories Indian Bands	DIAND - regulation and management of surveys on Canada Lands in the YT and NWT as well as fulfilling the Federal Government responsibilities regarding surveys for Native Land Claims Settlements Dept. of Environment - regulation and management of surveys within National Parks & Historic Sites and on historic canals as well as preparing descriptions for the Canadian Wildlife Service Dept. of Justice - advice and consultation relating to boundary survey problems	To obtain survey services and products, the Division contracts with professional land surveyors. Land surveyors are well organized professionally on a provincial basis and the basic skill level is controlled by professional assoc. Regulatory work cannot be readily contracted out 95% of the OGD funds provided for surveying requirements are contracted out Due to shortages of divisional O&M funds, there has been no contracting out in the area of direct LSD responsibilities			The demand for services is expected to continue increasing due to: Native Land Claims Settlements; the trend for Indian self-government; and the automation program for the Indian Land Registry To meet these new demands, LSD is preparing a 5-year plan. Some of its major points are: the elimination of in-house production work in favor of contracting out and cost recovery; increased privatization of services; and an increase of advice, consultation and training to Indian Bands and private surveyors			
	Custody of Records	To establish and maintain the integrity of records of legal survey work on Canada Lands and the integrity of the survey framework by ensuring that records have received the correct legal approvals; by maintaining and preserving records indexes, graphical survey and parcel indexes; by monitoring the adequacy of existing boundaries, framework and mapping; and by responding to requests for information	INPUTS: Records OUTPUTS (1985/86): 3340 plans ratified and recorded 29500 survey overlays 1700 parcel cards 12000 replies to requests for information from CLIS	Ratifications CLIS operations Requests for information Cadastre, framework overlays Monitoring of boundary, framework and mapping	PY 49 In-House 49 Contract NIL In-House (\$) Contract (\$) Capital (\$) Total Revenue			Other SMD divisions OGDs Provinces and Territories General public Survey community Indian Bands	Territorial governments Land registrars in YT and NWT Private surveyors	The custody of official records is a function that cannot be readily contracted out Little contracting out of custodial responsibilities because it is primarily an internal function. Some contracting out of the preparation of overlays. No contracting out of records automation due to shortage of O&M funds		None	Automation of the Canada Lands Information System (CLIS) data	Need to automate the records system so as to render it more accessible and efficient to outside users and to LSD staff		

A.5
SURVEYS AND MAPPING BRANCH
INTERNATIONAL BOUNDARY COMMISSION (IBC)-CURRENT SITUATION

PRODUCT/SERVICE	ACTIVITIES/PROCESS	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COSTS					MARKETING	INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES
					85/86	86/87	87/88	88/89	89/90	CLIENTS					
INTERNATIONAL BOUNDARY	Negotiation and Co-ordination (with the U.S. section) Field Operations Regulation Information	To ensure the integrity of the 1891-ka international boundary between Canada and the United States as required by treaties and statutes	INPUTS: OUTPUTS (1985/86): Negotiation and Co-ordination (ongoing) Field Operations boundary line surveyed (200ka) boundary vista cleared (115ka) boundary monuments rebuilt (25) boundary monuments inspected (300) Regulation regulatory items dealt with (15) Information requests for information (125) annual and technical reports published (2)	Inspection of the boundary the repair/replacement of damaged boundary markers maintenance of clear boundary "vistas" or on swath through bush and trees ensuring the accuracy of the boundary through surveys the definition of any portion of the boundary that may be questioned by either government	PY 11.5 In-House 9.5 Contract 2 In-House (\$) 697K Contract (\$) 0 Capital (\$) 0 Total 697K Revenue N/A	.068 (Canada & US Provinces/states) .RCHP Border Patrol Customs and Immigration Coast Guard Public	As the only custodian of boundary information, IBC supplies positional data, details of monuments, copies of reports and other documents, and boundary maps to the public and private sector upon request	The Commission reports through the Secretary of State for External Affairs As part of a bilateral treaty organization, the Canadian section works closely with its U.S. counterpart Frequently co-operates with law enforcement and regulatory agencies in both countries	Vista clearing has been contracted out for the past 15 years with larger portions contracted out since 1980. Recently, contracting has been expanded to more remote regions along the boundary IBC has engaged the Dept. of National Defence personnel to carry out certain technical surveys using specialized equipment and techniques. This work was undertaken at very little cost to IBC and it also provided training exercises for DND Bilaterally sensitive work (e.g. rebuilding boundary monuments and control surveys) is maintained in-house 52% of D&M resources are contracted out 20% of total resources are contracted out	None	Through contact with the various contractors, IBC remains abreast of technological changes in right-of-way maintenance. Significant changes are infrequent in this technology IBC relies on the Geodetic Survey Div. and the U.S. National Geodetic Survey to keep it abreast of the rapid advances in control survey technology and graphical positioning systems IBC has undertaken the development of a computer data bank - containing technical data on the international boundary points monuments and survey station boundary records regulatory data	IBC has developed a Long Range Forecast to assist in planning for the maintenance of an effective boundary line, to be carried out on a financially shared basis In principle, the two IBC sections have contributed equal funding to the work of maintaining the boundary. Over the last four years, Canadian funding has fallen behind that of the U.S. This could be a problem should it continue The partial settlement of the Gulf of Maine boundary dispute and the existence of 4 unsettled portions of the offshore international boundary may involve IBC in the physical determination of these maritime limits - necessitating additional resources and access to sophisticated technology for boundary positioning			

ERRATA SHEET

Revisions to: Annex A.6 Reproduction and Distribution Division
Current Situation

Row	Column	Line	Revision
1. Lithography	Issues	5	Should read: "Queen's printer has always felt that all maps should be printed by that organization.' <u>It was attempted in the 1950's and given up.</u> "
2. Air Photo Reproduction	Interfaces	3	Delete: "Interface with distribution of Air Information Publication".
3. Air Photo Reproduction	Issues	4	Should read: "Private sector currently handles existing demands for this type of work <u>in Ontario and Quebec</u> ".
4. Map or Chart Warehousing and Distribution	Distribution Channel	10	Should read: "Free issue based upon controlled levels".
5. Map or Chart Warehousing and Distribution	private Sector Skills and Absorption Capacity	1	Should read: "Dealerships <u>can be created</u> in same areas...".
6. Map or Chart Warehousing and Distribution	Private Sector Skills and Absorption Capacity	5	Should read: "Private sector currently operates similar warehouses; e.g., <u>K.G. Campbell Corporation</u> ".

ERRATA SHEET

Row	Column	Line	Revision
7. Map or Chart Warehousing and Distribution	Future Plans and Impact of Technology	3	Delete: "There are concerns as to where SMB initiates it or Treasury Board".
8. Map or Chart Warehousing and Distribution	Issues	4	Delete: "Customer accounts only established where is is through an established business dealer."
9. All Information, Publication Distribution	Interfaces	1	Delete: "Canadian Centre for Remote Sensing".
10. National Air Photo Library	Interfaces	1	Replace: "Air Photo Reproduction" with: "Canada Centre for Remote Sensing".

(SUB-ACTIVITY: MAP PUBLISHING)

SUB-SUB-ACTIVITY	LONG TERM OBJECTIVES	INPUTS/OUTPUTS	PROCESS	PROGRAMMED OUTPUTS AND COSTS (1985/86 \$'000)		MARKETING CLIENTS	DISTRIBUTION CHANNEL	INTERFACES	PRIVATE SECTOR SKILLS AND ABSORPTION CAPACITY	DUPLICATION	FUTURE PLANS & IMPACT OF TECHNOLOGY	ISSUES	
				DIRECT	INDIRECT								
PHOTOMECHANICAL AND PHOTOTYPE	To provide photochemical and phototype services to the topographical and geographic sub-activities and to provide duplicate map and reproduction material for other governments and industry upon request	INPUTS: negatives/manuscripts; blue line copies; clear plastic with names; package for each colour; corrected completed map; scribed material; names contact list; corrected gal coats	Provision of phototype as required by compilers Conversion of rough compilation manuscripts to fair-draw, colour separated, reproducible plan Duplication of map reprint for sale to other governments and industry as base material for depiction of thematic subjects	Person Years Salary (\$) Other OAR (\$) TOTAL OAR (\$) Contract (\$) Capital (\$) Costs Recovered (\$)	35.4 1076 789 1885 100 18 0	3.6 111 136	Aeronautical Charts and Air Information Publications Cockpit use by pilots, both commercial and private	Distributed in response to demand	The speed and content of the photochemical section depends on the compiling section Photochemical provides services and aeronautical, topographical and geographical sub-activities Most of the relevant process done beforehand and only partly done at reproduction	Contracting levels: Retouching NIL Camera NIL Photolab *201 Phototype *401 - 401 Plastic *151 - 201 Not many outside firms can do the work, they do not have the cartographic skills Values are small and thus, large private sector firms would not be interested Will take contracts if they can pre-empt ahead of time	Work currently done in private sector	Complete renovation of photochemical plant Programmable raster image scanners High quality image scanners Increased and improved graphics and text integration software	Does not initiate any work of its own, responses to the needs of other activities Agreements with divisional directors annually, who provide internal resourcing and determine level of contracting Staff are rotated to maintain the required level of resourcing which could not be accomplished otherwise Government will need to develop this process before new positioning Speed and content of this process depends on what happens in the compiling section of the products found in the other sub-sub-activities
LITHOGRAPHY	To lithographically reproduce topographic maps, aeronautical charts, air information publications (graphics only), geological maps and hydrographic charts in response to demand from users, and to maintain stocks of existing items	INPUTS: Lithographic plates; printing paper; Jobsite Envelopes OUTPUTS: Printed maps; air information publications; geological maps; hydrographic charts	Prepare printing plates using vacuum frame and plate processor Print in specified quantity by offset lithography Fold to specification Box and label Deliver to CMO or direct to customer	Person Years Salary (\$) Other OAR (\$) TOTAL OAR (\$) Contract (\$) Capital (\$) Costs Recovered (\$)	34.2 624 714 1738 732 1310 SEE CANADA MAP OFFICE	3.4 137 119 258 0 0	Distributed in response to demand	Interface with photochemical for information to be provided on plates to be printed Interface with distribution and warehousing	Priorities set on contracting out for printing as follows: 1. Ministerial or departmental publications 2. Cyclical aeronautical 3. Expressions of urgency 4. Restock of emergency map stocks below 250 5. Continue new and revised titles 6. Other restocking Digitizing does not reduce the need for new colour printing presses Printing may also be done by Queen's printer, provincial offices and the private sector	Work currently done in private sector and the provinces	New presses purchased in 1983/84 for \$1.6 million and in 1985/86 for \$1.4 million Change of technology for 2 colour printing presses to 4 and 7 colour printing Specified quantities should include minimum requirements of the Department of National Defence Introduction of laser plotters and printers Use of computerization and digitization in pre-press, pressroom quality control	Plate making process may be seen as integral to the lithographic process Printing has always been the main target in any analysis of SMB Queen's Printer has always felt that all apps should be printed by that organization RDD has already divested itself of all the printing of apps it can Specified quantities should include minimum requirements of the Department of National Defence	
AIR PHOTO REPRODUCTION	To produce copies of survey, airborne remote sensing and satellite imagery for sale to governments, industry and the public in response to demand	INPUTS: Copies of survey, airborne remote sensing and satellite imagery in black and white and colour film OUTPUTS: Contact prints; enlargements; film diapositives; transparency; mosaics	Inspect, clear and re-expose negative reels Maintain archival records Operate contact printers, copy camera and enlargers	Person Years Salary (\$) Other OAR (\$) TOTAL OAR (\$) Contract (\$) Capital (\$) Costs Recovered (\$)	33.3 889 443 1532 234 20 SEE NATIONAL AIR PHOTO LIBRARY	6.3 168 130 298 0 0	Reps (Topographic & Geographic) All areas of public and private sectors	Distributed in response to demand To meet national emergencies To process DMB's domestic demands	National Air Photo Library Interface with distribution of Air Information Publications Contracting out handles off-peak and peak production Priority for production: Ministerial or departmental First demand is, first out Private sector now handles the same for the provinces	Work currently done in private sector and the provinces	Cyclical nature of the sub-sub-activity handled through diversification Reliance of staff an absolute necessity Private sector currently handles existing demands for this type of work Aerial colour photography is considered to be specialized and expensive Alberta currently uses private sector to handle process Note the same issues that relate to the reproduction of printed material through the use of the private sector instead of RDD		
MAP OR CHART WAREHOUSING AND DISTRIBUTION (CANADA MAP OFFICE)	To maintain a basic inventory of maps and charts in support of Federal contingency plans, and for distribution to governments, industry and the public in response to demand	INPUTS: Maps; charts; map shipment supplies; orders; requests OUTPUTS: Maps; charts	Warehouse activities Receive and store new stocks Process and fulfill orders Provide information Support dealers Develop materials	Person Years Salary (\$) Other OAR (\$) TOTAL OAR (\$) Contract (\$) Capital (\$) Costs Recovered (\$)	20.4 517 482 999 128 39 3606	8.7 228 94 314 0 0	Nothing planned Branch appears to rely on distribution as their means of marketing	Division only allowed to make the data available in digital form on only a very limited basis Regional Sales Agreement covers all aspects of distribution, including coverage & inventory levels to be maintained Free issue based on varying levels Consignment sales based on cash and carry To process DMB's domestic demands	Interface with Lithographic printing Dealerships may exist in the same areas where there may be limitations to distribute this type of material Private sector currently operates similar warehouses	The need to maintain complete warehousing operations in both Ottawa and Sherbrooke	DMB is moving towards a total warehousing status. There are concerns as to whether SDB initiates it or the Treasury Board List prices established by the most common product type are comparable in terms of reproduction cost and distribution cost Customer accounts only established where it is through an established business dealer Obsolete material sold at fair market value Costs recovered are those not associated with official requirements (See Separate Step) Thirty days issue of maps cannot total 20,000,000 maps in stock Inventory control systems and not users needs are identified by a sophisticated and helpful market study There needs to be use of existing provincial warehousing facilities		
AIR INFORMATION PUBLICATION DISTRIBUTION	To distribute air information publications to governments, industry and the public in response to demand	INPUTS: Orders; subscriptions; requests; publications OUTPUTS: Filled orders; completed subscriptions; subscriptions filled; renewals and changes; single copy orders	Database systems of subscriptions on computer Coordinate labels, publications, packaging material for delivery to contractor Process orders for single copies	Person Years Salary (\$) Other OAR (\$) TOTAL OAR (\$) Contract (\$) Capital (\$) Costs Recovered (\$)	4.1 181 445 546 0 0 SEE CANADA MAP OFFICE	1.9 228 42 252 51 21	Air Photo Reproduction SMB Other DMB Branches ODS Provincial Gov'ts. Industry Educational Institutions Public	Distributed in response to demand To meet national emergencies Confined mostly to the colour work for the Canadian Centre for Remote Sensing which resells the products to users	Canadian Centre for Remote Sensing and Photomechanical and Lithography	Private sector currently handles the distribution of aeronautical charts	Even though the search after the request takes up most of the time, the customer may NOT order The majority of the work done here is a response to the client's requests		
NATIONAL AIR PHOTO LIBRARY	To maintain a national library of Federal aerial photography and to advise and assist governments, industry and the public in selecting and acquiring reproductions	INPUTS: Requests from customers and the general public OUTPUTS: Filled orders; Advice to customers	Maintain, index and catalogue hard copy of data Maintain latest coverage in microfilm Operate advisory service Operate order service	Person Years Salary (\$) Other OAR (\$) TOTAL OAR (\$) Contract (\$) Capital (\$) Costs Recovered (\$)	14.6 390 24 414 24 0 1200	2.6 70 28 106 0 0 N.A.	Duplicate Map Production Materials Supplied to prov. gov'ts, industry (particularly publishers, planners & resource users are as bases to depict & record info., and are often included in published reports, proposals, etc.	Based on used demand Used especially for DMB's, provincial governments and industry	Air Photo Reproduction	Computerization of air photo catalogues	The concurrent use of contractors and public service employees in this process may prove to be cost effective Use of invoices may also prove to be cost effective		
							AIR PHOTOS (NATIONAL AIR PHOTO LIBRARY) Wide variety of users Cdn. Forestry Service Developers of major pipeline proposals Legal purposes						