City of Winnipeg
Water and Waste Department

Combined Sewer Overflow Management Study

PHASE 2 Technical Memorandum No. 7

Phase 2 Workshop

Internal Document by:

WARDROP Engineering Inc. and TetrES CONSULTANTS INC.

In Association With:

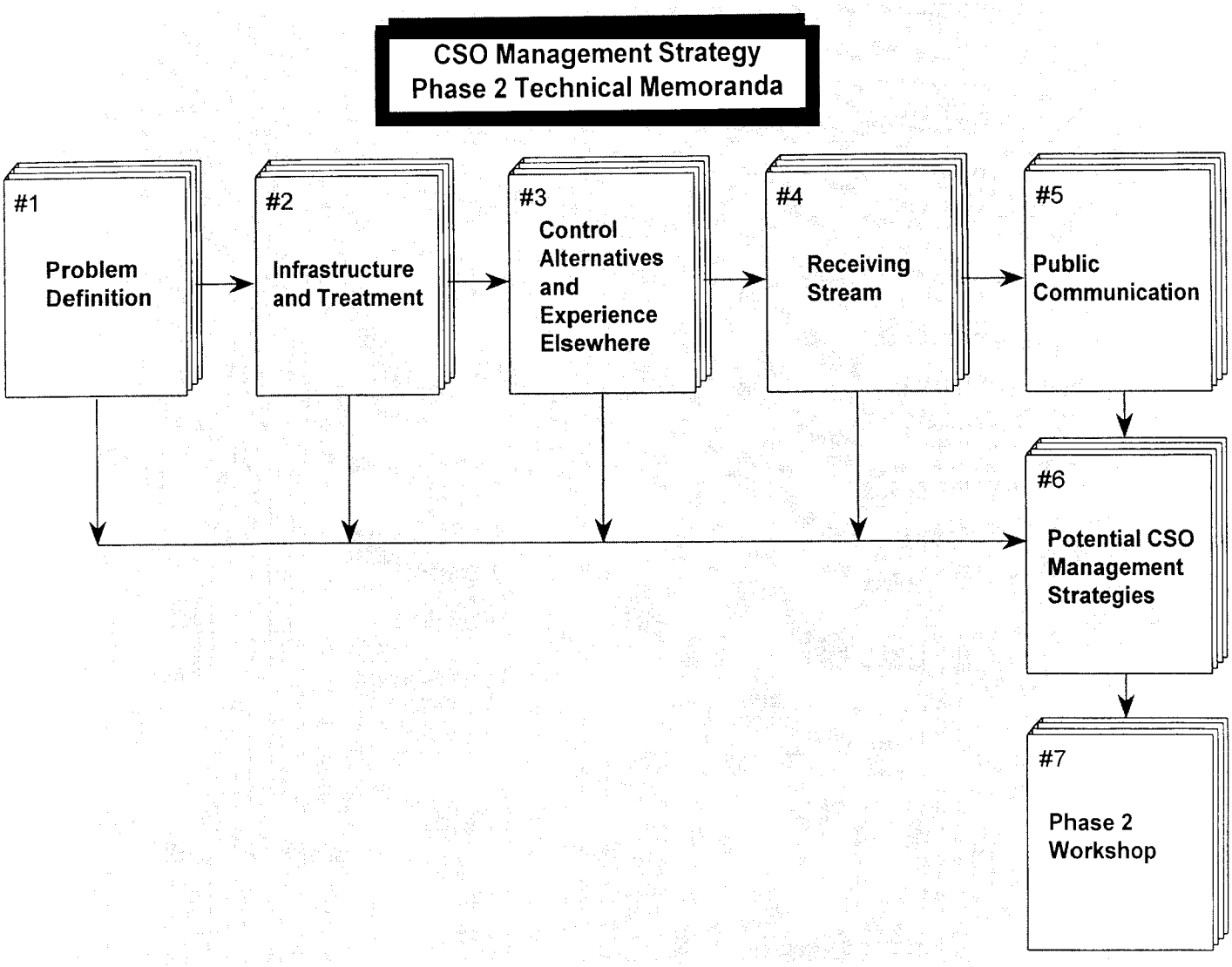
Gore & Storrie Limited and EMA Services Inc.

November 1995

PREAMBLE

This Technical Memorandum (TM) is one of a series of TMs provided during Phase 2 of the CSO Management Study for internal discussion. It is not intended as a report representing the policy or direction of the City of Winnipeg.

This particular TM is the last in the Phase 2 series. It reports on the results of the Phase 2 Workshop held to review the earlier TMs which reported on the progress of each study's workstreams.



Each of the Phase 2 TMs draws on information developed in the prior Phase 1 TMs. In addition, the Phase 2 TMs document information and study analyses sequentially. Ideally, therefore, the TMs should be read in the sequence shown.

TABLE OF CONTENTS

2.2 PHASE 2 OVERVIEW

During the early part of the first morning of the Workshop, attendees were provided with an overview of the background leading to the undertaking of the CSO study as well as an overview of the results of Phase 2 of that study.

G. Rempel reviewed milestones of the Phase 2 study, i.e., the conducting of a partnership workshop between the City and the local study team; the holding of eight working sessions (involving consultants and City representatives) and ten progress meetings and the presentation of four joint papers at local technical forums. In addition to these events, the study team completed the Phase 2 analyses (and the associated TMs) which were the subject of the Workshop.

To set the scene for the Workshop proper, Rempel provided an overview of the regulatory background, i.e., the CSO study resulting from a Clean Environment Commission (CEC) report (June 1992) on the application of water quality objectives to the Red and Assiniboine Rivers. The most pertinent recommendations of that report (Recommendation No. 7) directed that a fecal coliform study should be undertaken. The City of Winnipeg incorporated the scope of the CEC recommendation in the Terms of Reference for this study and further expanded the study. The key product of the study was to be "a cost-effective prioritized Implementation Plan for remedial work based on assessment of costs and benefits of practicable alternatives".

This overview was followed by an Executive Summary of the study results. R. Gladding presented an overview of the infrastructure/treatment workstreams. Gladding also provided an overview of potential CSO controls and the specific CSO controls that had been identified for review for the Winnipeg situation. D. Morgan gave an overview of the technical approaches taken to the integrated set of models and the manner in which these models were calibrated. During his presentation, he emphasized the great quantity of data which had to be processed in order to prepare the data in a format which could be accepted in the succeeding model (illustrated on Figure 1). The models discussed were: runoff (XP-SWMM), interceptor model (XP-SWMM), a model based on an object-oriented programming language developed for control alternatives, receiving stream model (WASP), and post-processing for superposition, control alternatives, compliance and graphics (also using an object-oriented language). Three items of particular significance insofar as calibration is concerned was: the use of data from the City's monitoring of flow and quality of CSOs, for the calibration of the

LIST OF ILLUSTRATIONS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

The Study Team acknowledges, with sincere appreciation, the contribution of many individuals and agencies consulted in the course of Phase 2 of the CSO Management Study. The Study Team especially acknowledges the assistance of the City of Winnipeg Project Management Committee and the Advisory Committee.

Contributors to the TMs included:

Consultants: Wardrop Engineering Inc./Tetr*ES* Consultants Inc.
in Association with Gore & Storrie Limited/EMA Services Inc.

G. Rempel, Project Manager
R.J. Gladding, Assistant Project Manager
R.R. Foster
D. Morgan
N. Szoke
G. Steiss
S. Quigley
R. Rempel
G. Mohr
D. Dagg
J. Anderson
P. Nicol
M. Parente
W. Clarke
S. Black
L. Thompson

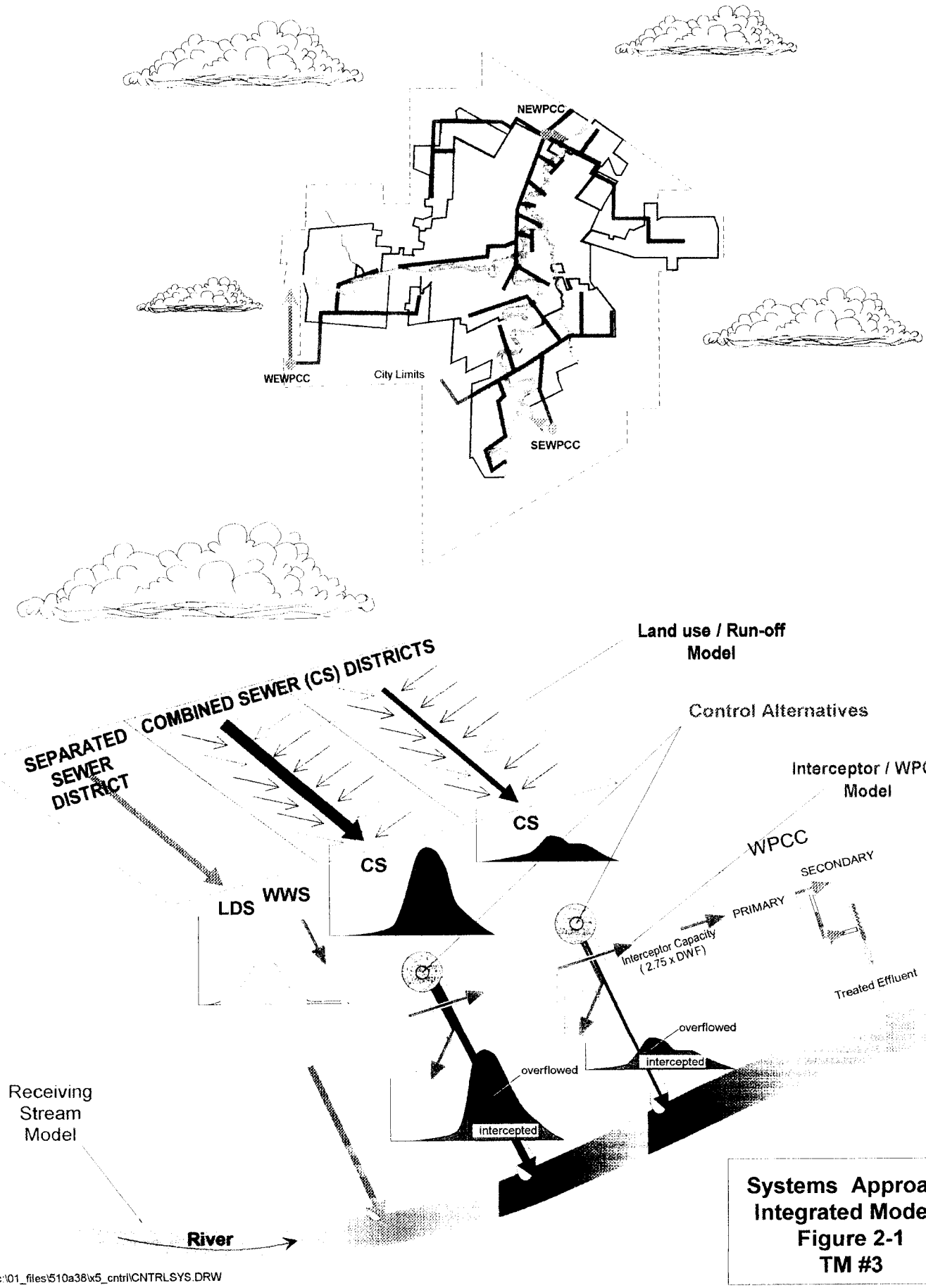
City of Winnipeg: Water & Waste Department Project Management Committee

E.J. Sharp, Project Manager
D. Wardrop
M. A. Shkolny
A. Permut
W.J. Borlase
P. Lagasse
P. Kowalyk
T.R. Pearson
D. McNeil

Specialist Advisors:

D. Weatherbe - President, Donald G. Weatherbe Associates Inc.
G. Zukovs - President, W20 Inc.
C. Rowney - Water Resources Specialist, Parsons Brinckerhoff

The study team extends particular thanks to Ms. N. Wheatley and Mr. P. Moffa who, in their role as special external advisors, have participated in both Phase 1 and Phase 2 Workshops. They have provided an important and informed outside perspective to the Winnipeg circumstances and their advice has been valuable both in their critical review of the work done to date and assistance in developing the direction of future activities.



Systems Approach Integrated Models Figure 2-1 TM #3

c:\01_files\510a38\x5_cntrl\CNTRLSYS.DRW

1.0 INTRODUCTION

1.1 PURPOSE

The Workplan for the CSO study provided for the conducting of a Phase 2 Workshop to review:

- the technical approaches, including the application of the various models and the model results;
- assessment of existing infrastructure (interceptor and treatment);
- the screening of the array of control alternatives available and identification of candidate options for further study;
- the status of the pilot testing program;
- analysis of impacts of CSO and other loadings to receiving streams;
- the public communication program conducted to date; and
- evaluation of potential Winnipeg CSO strategies developed in Phase 2.

The Phase 2 Workshop was the second in a series of such workshops which are to be conducted at the end of each phase, prior to the preparation of the report for that phase. The purpose of these workshops is to provide the study team, the City's project management committee and the technical specialists, with the opportunity to review and discuss progress to date on all of the activity streams and, in the case of the technical specialists, to provide an expert opinion on the various aspects of the project.

The Workshop process is enhanced by the participation of a group of technical specialists, each of whom has relevant experience in dealing with CSO issues and in assessing the overall feasibility of technical solutions, taking into account financial, social and environmental factors. Their participation provides the City with the benefit of a broad range of relevant experience and mature judgement on existing and evolving trends in wet weather flow (WWF) management. Their participation provides a forum of Quality Assurance (QA), similar to an ongoing Value Engineering process.

The Workshop was chaired by G. Rempel, Project Manager for the consulting team. The Agenda for the two-day workshop is attached in Appendix A).

1.2 PARTICIPANTS

The participants in the Phase 2 Workshop were as follows:

1. City of Winnipeg, Project Management Committee:

    - Ed Sharp, P. Eng., Project Manager
    - Barry MacBride, P. Eng., Manager of Engineering
    - Bill Borlase, P. Eng., Manager of Regional Operations
    - Arnold Permut, P. Eng., Manager of Laboratory Services
    - Paul Lagasse, P. Eng., Wastewater Engineer
    - Mike Shkolny, P. Eng., Project Management Engineer
    - Doug McNeil, P. Eng., Wastewater Planning Engineer
    - Dave Wardrop, P. Eng., Operations Engineer
    - Tom Pearson, P. Eng., Manager of Local Water and Sewer.

2. Consulting Study Team:

    - George Rempel, P. Eng., Project Manager (President, Tetr*ES* Consultants) and Chair of the Workshop.

    - Wardrop Engineering Inc.
        - Bob Foster, P. Eng., Managing Director
        - Bob Gladding, P. Eng., Senior Engineer
        - Gord Steiss, C.E.T., Senior Technologist

    - Tetr*ES* Consultants Inc.
        - David Morgan, P. Eng., Senior Engineer
        - Nick Szoke, P. Eng., Senior Engineer
        - Roger Rempel, P. Eng., Intermediate Engineer

    - Gore & Storrie
        - M. Parente, P. Eng., Senior Project Manager

- EMA Limited
  - Bob Skrentner, P.E., Senior Engineer (Vice-President)

- Parsons Brinckerhoff
  - Charles Rowney, P. Eng., Ph.D., Water Resources Specialist.

3. Technical Specialists:

   - Nancy Wheatley, Technical Services Director, Sanitation District of Orange County, California.

   - Peter E. Moffa, P.E., Principal, Moffa and Associates Consulting Engineering, Syracuse, New York.

   - Donald Weatherbe, P. Eng., President, Donald G. Weatherbe Associates Inc.

   - George Zukovs, P. Eng., President, W2O Inc.

The addresses and phone numbers of these various individuals are provided in Appendix B.

2.0 BACKGROUND INFORMATION

2.1 TECHNICAL MEMORANDA

Prior to the Workshop, each attendee was provided with a set of Technical Memoranda (TMs) dealing with the Phase 2 study workstreams. These comprised:

- TM #1 - Problem Definition
- TM #2 - Infrastructure and Treatment
- TM #3 - Control Alternatives and Experience Elsewhere
- TM #4 - Receiving Stream
- TM #5 - Public Communication
- TM #6 - Potential CSO Management Strategies

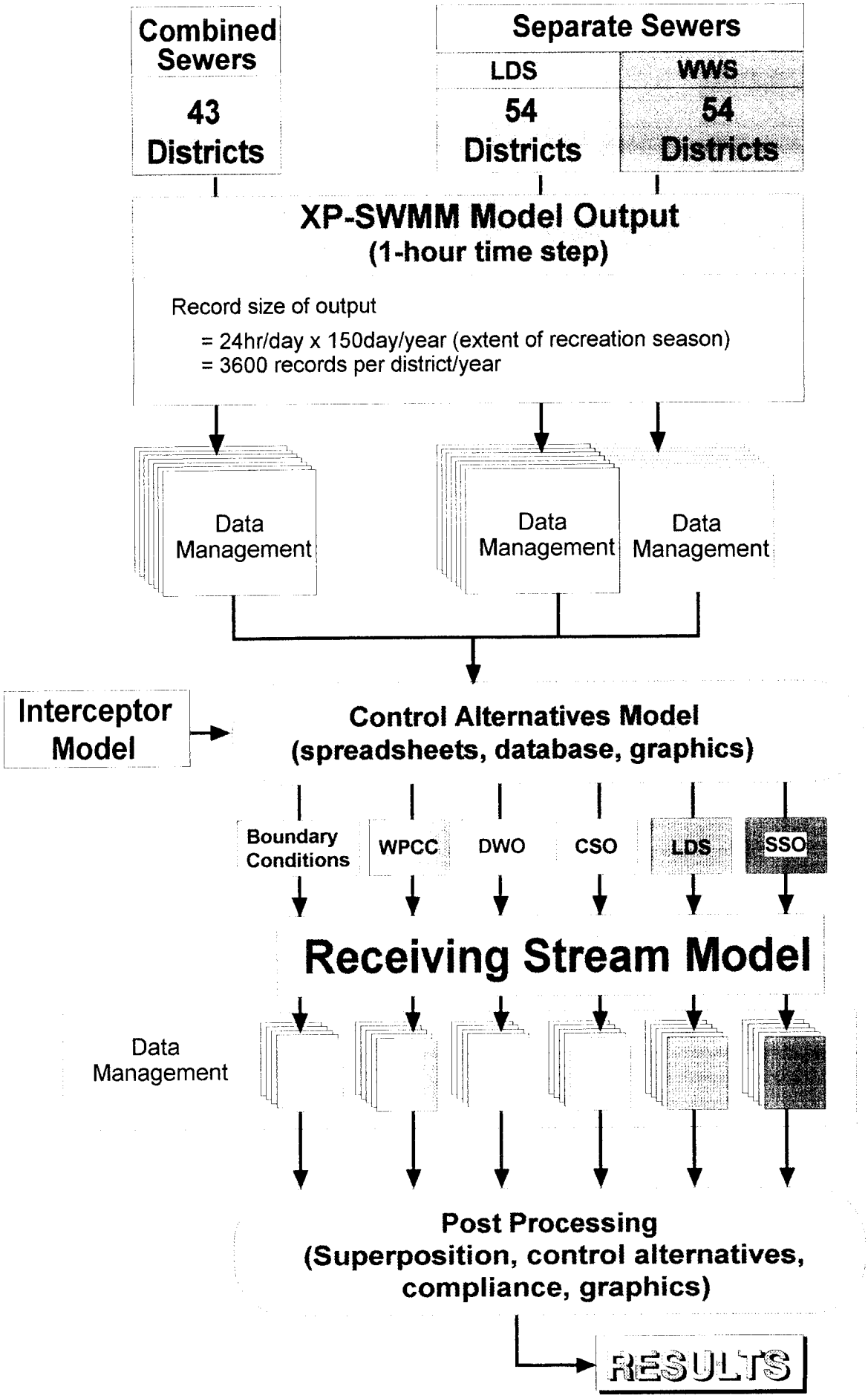


Figure 1

c:\01_files\510a38\x4_river\SWMMMOD.DRW

runoff model; the City's FAST alarm data, as a means of checking overflow projections, and the City's river water quality monitoring program, which allowed calibration of the river model.

G. Rempel gave an initial overview on alternative plans, their relative costs, and relative benefits. He put the CSO control strategies into perspective in terms of their projected costs as compared to other City of Winnipeg public works projects and the associated need to gain public input into the definition of potential control plans.

3.0 EXISTING SYSTEM

3.1 PROBLEM DEFINITION

R. Rempel gave a 10-minute presentation on the runoff model, as described in TM #1. The model results compared very favourably with monitored results in a number of districts over a range of storms. On this basis, a runoff model for all of the combined sewer districts and separate land drainage systems was developed. This model was run for a range of years of rainfall records, with runoff hydrographs produced for each district. R. Rempel also discussed the application of fecal coliform Event Mean Concentrations (EMCs) to the predicted urban discharges, use in the subsequent analysis in the river model.

The concepts behind the modelling of the entire runoff/interception/control/river system are illustrated in Figure 1-1 from TM #3.

3.2 INFRASTRUCTURE/TREATMENT

Gladding gave a presentation of the infrastructure/treatment aspect of the work, as described in TM #2. The focus of the discussion was primarily the Main interceptor which conveys 90% of combined sewer flows to the North End Water Pollution Control Centre (NEWPCC). A physical inspection of the Main interceptor sewer indicated that it is, for the most part, in excellent condition. The overall hydraulics of the system is governed by the six raw sewage pumps at the NEWPCC (i.e., at the downstream end of the system). The original intent of the diversion structures at each of the combined sewer (CS) outfalls was to divert 2.75 x Dry

Weather Flow (DWF) to the interceptor. A review of the hydraulics at each CS outfall indicated interception rates ranging from 1.3 x DWF to 26 x DWF, with an average of 4.2 x DWF. The main findings of the interceptor study was that it could convey five times DWF uniformly from all tributary CS districts without overflow at the designated overflow point at St. Johns. A flow 5 x DWF in combination 8 x DWF from the northeast/northwest interceptors would exceed NEWPCC capacity. If expansion of the NEWPCC was required to accommodate wet weather flow (WWF), this could be accommodated at the present site. Phase 3 will investigate this further. The peak WWF to the South End and West End WPCCs would only be moderately influenced by CS flows.

3.3 BREAKOUT SESSION NO. 1

The first breakout session was held at the end of the presentation of the first two TMs. The attendees broke into three discussion groups as indicated on Table 1.

Prior to the breakup into groups, the meeting as a whole developed a series of questions or concerns which were set-down as possible discussion points. Some of these concerns or comments in themselves represented useful guidelines for Phase 3 investigations or for follow-up on Phase 2 considerations. Both the discussion items, and the comments from the discussion groups, are summarized in point-form below and indicate items which will be followed-up in the near future or through the course of Phase 3.

3.3.1 Problem Definition Considerations

- The runoff hydrograph calibration should be analyzed for sensitivity to variations in the catchment width (for those districts beyond the range of the widths of the districts used for calibration purposes). It was suggested that this could be carried out over a range of variation in catchment width of 0.5 to 2 times the width used in the regional model (Phase 2 follow-up).

- It was suggested that the sensitivity of receiving stream concentrations to variations in fecal coliform concentrations (EMCs) should be tested. In a related matter, it was

TABLE 1

BREAKOUT SESSION PARTICIPANTS

PURPLE	GREEN	RED
P. Lagassé	M. Parente	T. Pearson
E. Sharp	A. Permut	G. Rempel
P. Moffa	M. Shkolny	G. Zukovs
D. McNeil	D. Weatherbe	B. MacBride
G. Steiss	R. Skrentner	N. Wheatley
R. Rempel	B. Borlase	B. Gladding
C. Rowney	D. Morgan	N. Szoke
	B. Foster	D. Wardrop

proposed that the effect on compliance of variations in fecal coliform die-off rates in the stream should also be tested (Phase 3).

- In spite of the good calibration results, the question was raised as to whether or not we needed to improve our confidence with the runoff modelling. In this regard, it was suggested that the results of the current analysis for the 1992 representative year should be compared with the previous work done for the City of Winnipeg in the MacLaren 1979 Study on city-wide runoff (Phase 2 follow-up). It was also proposed that the study team undertake a water balance, i.e., do an inventory of rainfall versus runoff and identify the allocation of water to runoff, overflow, depression storage, etc. This will be considered for Phase 3.

- It was agreed that the performance of control options considered would be run under long-term rainfall conditions. This may or may not comprise a series of sequential years or could comprise selected combinations of high and low rainfall years with high and low river flows (Phase 3).

- The question arose as to whether or not EMCs for fecal coliforms (FC) should apply to all events, i.e., is there a first flush implication. The available City data does not indicate an elevated first flush FC concentration. In general, it seemed to be agreed that first flush probably does not represent a concern for FC. It was generally considered that the use of EMCs for planning purposes was appropriate. The use of "real time" concentrations would be more important for a single event evaluation.

- The question was raised as to whether or not we could rely on NURP data. The consensus was that these presented realistic guidelines but should only be used for justification of selected EMCs based on City-specific data. This was the procedure used.

- One question which arose from the discussions was whether or not the public was especially concerned about debris in the rivers which could be attributable to CSOs. This is not known and will be considered as a question to be included in any opinion survey.

- A uniform, areal distribution of rainfall is appropriate for most alternatives but may not be appropriate for regional tunnels, i.e., the study team may be overstating storage requirements for the regional tunnel option. (This may be reviewed further in Phase 3).

3.3.2 Infrastructure/Treatment Discussion

- It was proposed that the study team assess the implications of increased WWF to the NEWPCC in terms of disposal of bio-solids, particularly with regard to potential problems regarding year-round disposal; farmland availability; quality control. This will be addressed in Phase 3.

- The study team were asked to provide a flow sheet of WWF handling at the WPCCs, i.e., by-pass, disinfection, solids handling, etc. (Phase 3, if needed).

- The study team will need to assess the implications (river quality) of the manner in which effluent disinfection is applied to DWF and WWF (Phase 3).

- One of the breakout groups indicated that the study team should review advanced primary treatment for additional WWFs, i.e., chemical addition. This may not be necessary in that the real concern with regard to the existing NEWPCC is not its ability to provide primary clarification but whether it is hydraulically able to convey the increased flows.

- The study team was asked to investigate whether or not some combined sewer flows could be diverted from the main interceptor (and hence the NEWPCC) via other systems to other treatment plants (e.g., Windsor Park to SEWPCC). The merit of this will be reviewed in Phase 3.

4.0 CONTROL ALTERNATIVES

Morgan and Gladding presented the contents of TM #3. Morgan addressed the regional model, the selection of the representative year, and the use of FAST data for calibration. The Regional Control Alternatives model was developed using ObjectPAL™, an object-oriented programming language, to read and write Paradox™ Database files. The input files were imported from XP-SWMM RUNOFF block and the output files could be further processed into summary files (i.e., number and volume of overflows per district) and input files for the WASP water quality model. The model inputs and complex interrelationships between models is

illustrated in Figure 2 from TM #4, attached. The representative year concept was developed as a means of screening control alternatives so as to reduce the number of options to be evaluated in Phase 3. The year was selected by determining the average frequency of storms of various sizes (for the period of record) and by ranking seasonal river flows. The years which most closely approximated both conditions were reviewed. 1992 was selected as the representative year for this study.

The City's FAST alarm system, among other alarms, records overflows at CS Outfalls and at sanitary sewage pumping stations. These data were compared to the number of overflows predicted by the runoff model for calibration.

Gladding presented the range of control alternatives considered; discussed the conceptual design bases used for sizing them; and provided the conceptual design costs developed for each. This presentation was followed by brief comments on CSO control technologies by D. Weatherbe (UV disinfection for WWF), P. Moffa (VSS), M. Parente (RTB/Storage), and B. Skrentner (in-line storage and basic RTC). The highlights of the latter presentations follow.

All of these presentations were followed by the second breakout session of the Workshop. The same three working groups met and reported back to the Workshop. The questions tabled and the results of the discussion groups are provided after the technical presentations.

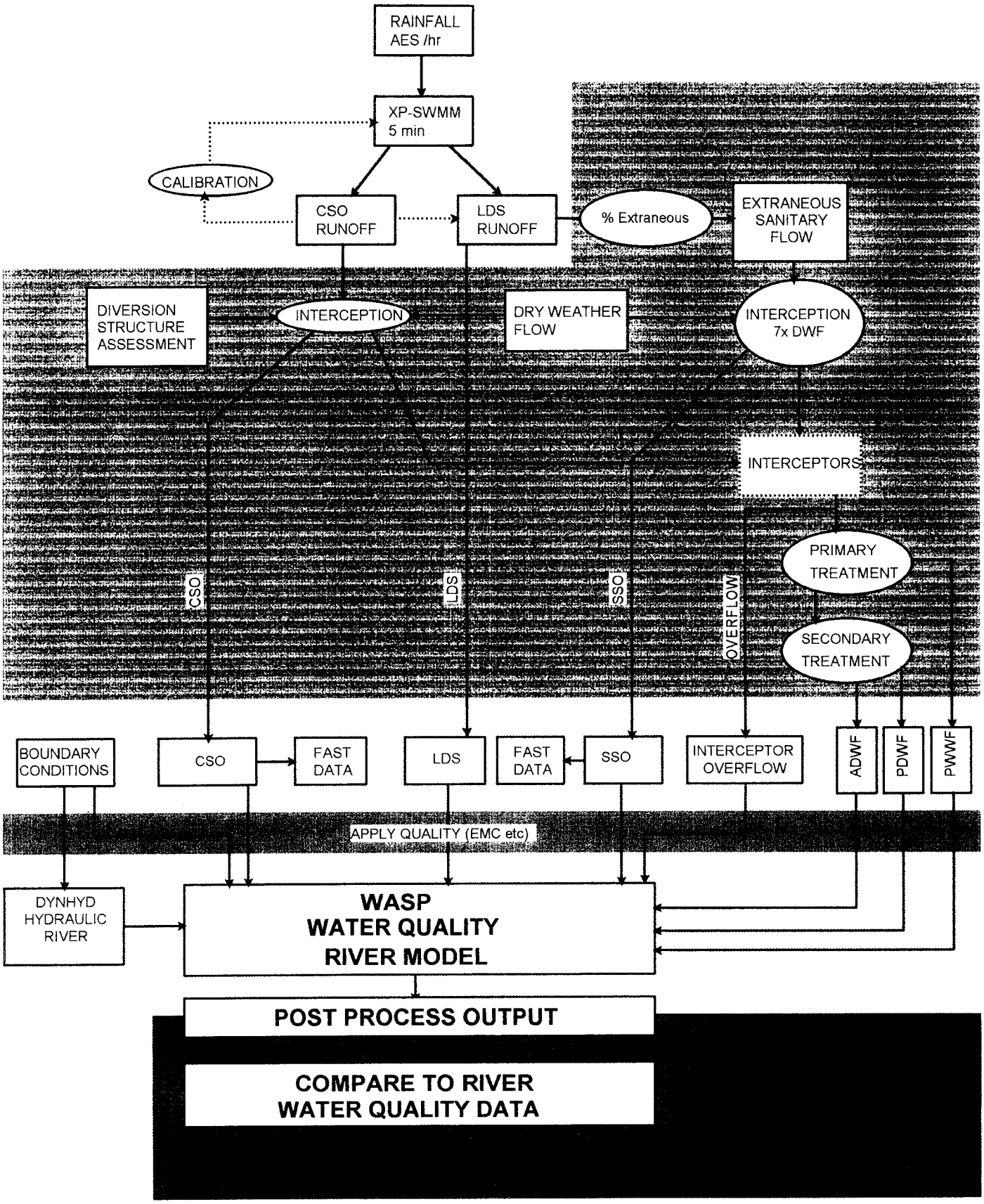
4.1 PRESENTATIONS

The following are summaries of the presentations on control technology by Weatherbe, Moffa, and Parente.

<u>UV Disinfection</u>

- Weatherbe noted that two key references on UV application are the EPA Document #832R-92-004 and the Environment Canada 1993 Report entitled "An Assessment of the Application of Ultra-Violet Disinfection Technology in Ontario". (copies were obtained)

- He noted that Trojan recommend medium-intensity lights for CSO. He indicated that the Scarborough data suggests a UV dosage of about 30 mWs/cm^2. This would produce a



Approach to Receiving Stream Modelling

Figure 2-1
TM #4

c:\01_files\510a38\x4_river\fig2-1a.DRW

residual of about 1,000 FC/100 mL from the initial concentration of about 10^6 or 10^7. These data are part of the same program that indicated the need for a VSS overflow rate of 5 m/hr to achieve solids concentration suitable for UV disinfection.

- Weatherbe suggested collecting combined sewage from Winnipeg and sending it to Trojan for testing. The testing would comprise UV dosage versus fecal coliform inactivation. He also suggested characterizing the solids in Winnipeg combined sewage and their settleability. This will be given further consideration in Phase 3.

VSS

- Moffa indicated that VSSs can run at 25 to 170 m/hr overflow rates for settleable solids and floatables removal. He noted that there is very little data on the UK and German units but fairly good data on the EPA Swirl. He noted that Syracuse has data on the UK VSS. He suggests that Swirls can remove 50% of suspended matter (excluding solids stored in the storage vessel). He recommends that we review our design basis for VSS operations (Gladding had used 10 m/hr on the basis of Scarborough pilot experience with UV disinfection). (Phase 3).

- Moffa believes that VSSs are effective for floatables removal and noted that New York is currently running side-by-side tests on each of the three VSS technologies. He added that VSSs do not need upstream mechanically-cleaned bar screens. They do need trash racks to operate safely.

- Moffa noted that an analysis of a proposed Syracuse, New York, installation (diameter 62 ft, depth 28 ft) indicated that a device designed for treating the peak flow for a 1-year event would, over the full season, store approximately 85% of the total volume of CSOs for that system. This analysis included in-line storage and interceptor capacities.

- Moffa considers VSSs suitable pre-treatment devices for disinfection with chlorination or chlorine-dioxide. Chlorination would be effected at a high rate (12 mg/L of chlorine for a 5 minute contact time with rapid mixing). He does not think that the VSS is a suitable device to be used in conjunction with UV technology.

- He noted that sludge storage is normally not needed. Interceptors usually have sufficient capacity to convey sludge to treatment. This would have to be investigated in Phase 3 for Winnipeg.

- Moffa noted that Decatur, Illinois is looking at settling basins versus VSS units in side-by-side pilot tests. He suggested a visit to the Decatur VSS tests. (Phase 3).

Storage/RTBs

- M. Parente gave an overview of concepts and features of retention treatment basins and storage vessels. He noted that Saginaw, Michigan has first flush tanks, VSSs and RTBs in place. This might prove to be a useful facility for future visits. He also noted that G&S have recently completed a design of a 10,700 m^3 storage facility for Sarnia, Ontario.

- With regard to cleaning methods for storage basins, he noted that a straw poll of operators in Toronto rated the three currently used options as follows (with 10 being the highest rating):
  - 0 for manual spraying;
  - 3 for fixed nozzles, for flushing the solids to the outlet; and
  - 9 for the tipping trough technology.

4.2 BREAKOUT SESSION NO. 2

The second breakout session was held in the afternoon of Day 1. As with Session No. 1, the discussion items and comments from the three groups are summarized below.

- Is it practicable to control WWF interceptions to five times DWF uniformly? (needs analysis - Phase 3)

- Is it permissible to reduce the current interception rate in any given district (as multiples of DWF) as a matter of policy? (needs review - Phase 3)

- Should interception rates vary, i.e., should we selectively bias the interception rates? (Phase 3)

- Can we integrate basement flood relief piping with CSO control, i.e., oversize some relief sewers and hence increase the potential for in-line storage? (Phase 3)

- It was agreed that we should not simply focus on average number of overflows but should deal with the effects of the overflow.

- The latter point led to the discuss on the meaning of four overflows per year. N. Wheatley indicated that the EPA considers that any event which causes one or more CSOs in the receiving body is an overflow event. Hence, one very local storm could cause an overflow at one outlet; a region-wide storm could cause multiple overflows at multiple outlets. Both would be considered to be one overflow event.

- Ontario draft regulations dictate that CSOs should receive the equivalent of primary treatment. This is not the focus of the Winnipeg study, since the objective is reduction of fecal coliform concentrations.

- Moffa noted that we should use higher than 4 m/hr for RTB overflow rates. European technology commonly goes to 10 m/hr and Cincinnati currently uses 7 m/hr. (Phase 3)

- Wheatley and Moffa suggested considering screening alone with chlorine disinfection. This apparently has been done successfully elsewhere but with long chlorine contact times.

- There was a general consensus among the attendees that the "representative year" approach was sufficient to screen alternatives, particularly since very few alternatives are being screened out.

- In the discussion of sewer separation, it was made clear that the option costed was effectively the separation of road drainage from the combined sewer system, i.e., not individual house separation, which would be more costly. It was also noted that we should explain the residual LDS impacts if separation was done. (Phase 3)

- In his discussion of floatables control, Gladding had only considered netting or screening at the combined sewer trunks not the relief pipes and not the LDS sewers. The relief

pipes might also need attention, although it was noted that much of the in-stream litter has been found in several studies to originate from LDS.

- With regard to Fresh Creek trash netting technology, Wheatley suggested talking to Boston who are not happy with their experience with this technology. She questioned whether our capital costs are too low especially for in-system netting. Both Moffa and Wheatley suggested talking to users and considering a demonstration project if we proceed further. They suggested careful review of operating costs. (Phase 3 investigation)

- The group queried whether or not it was too early to reject separation on the basis of cost as it is often seen as a logical option by the public. (Phase 3 consideration)

- The reviewers recommended integration of the CSO abatement study with the basement relief program. Such integration would review relief pipe oversizing and would also give credit for selective separation, for benefits from a CSO control perspective. At present, separation for flood relief has to be at least as cost-effective as pipe relief, whereas a credit for CSO control would allow it to be somewhat more expensive and still be considered a preferred option for relief.

- It was proposed that we make some attempt to quantify floatables, possibly through booming an LDS outlet and a CSO outlet. (Phase 3 consideration)

- In considering disinfection, the potential impacts of the use of chlorination on aquatic systems must be included, even with the use of de-chlorination. (Phase 3)

- If chlorination is considered a viable means of CSO disinfection, its effectiveness could be improved through the addition of high-rate rapid mixers. (Phase 3)

5.0 RECEIVING STREAM AND EVALUATION OF POTENTIAL STRATEGIES

N. Szoke delivered the overview of TM#4 (Receiving Stream) in the late afternoon of Day 1. This comprised the discussion of selection and development of the WASP water quality river model; the model results (FC concentrations in the rivers); comparison of the results to the extensive City of Winnipeg monitoring data; the confirmation through the model of the existence of DWOs; and the post-processing of the results.

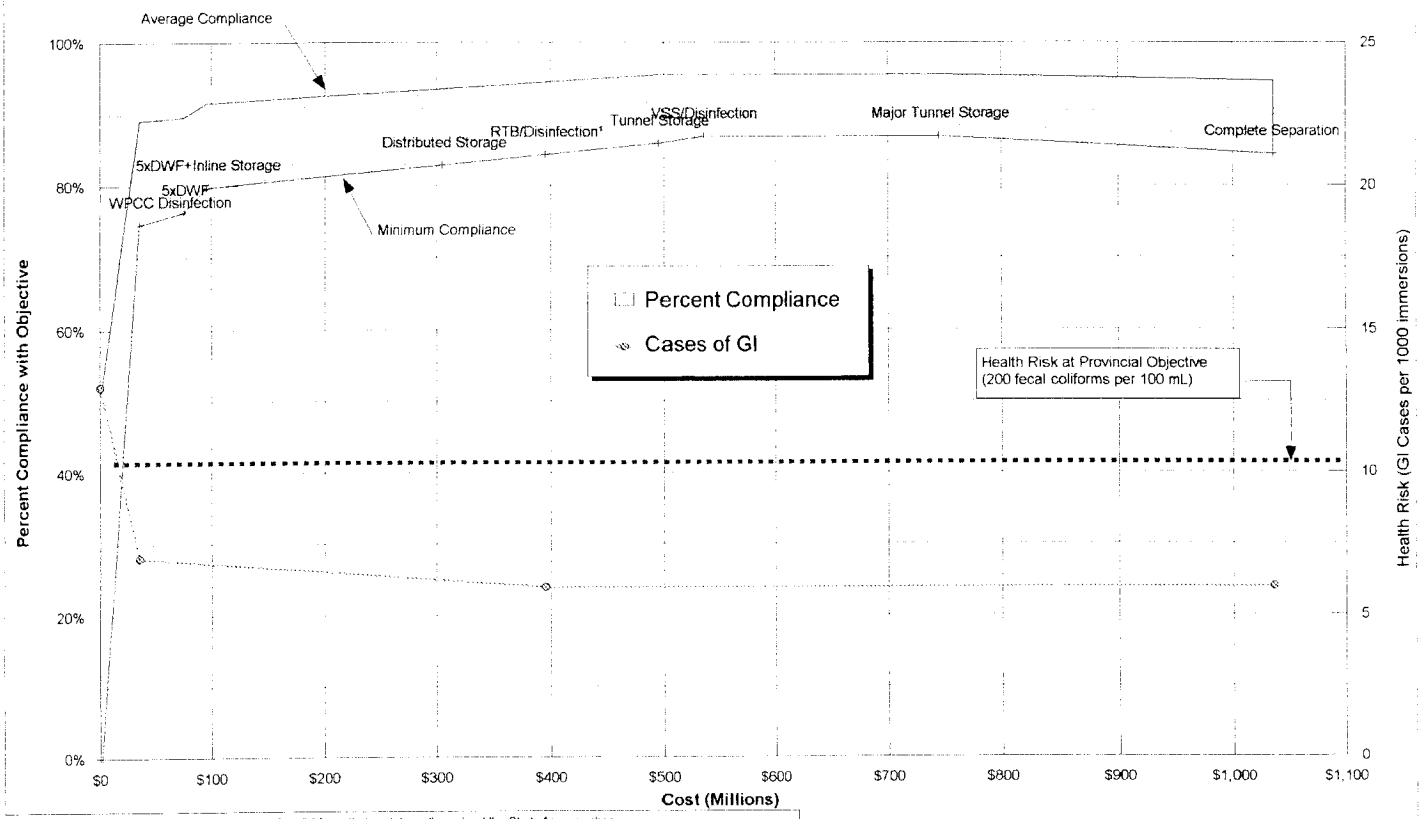
Of particular interest in the river modelling was the development of the post-processor.

In order to process the extremely large WASP output files, ObjectPAL (Paradox's objective-oriented programming language) programs were developed to produce Paradox files. The latter allowed a Paradox interface to produce a dynamic profile of fecal coliform concentrations along the river. These files were further processed with LOTUS 1-2-3 spreadsheets to produce fecal coliform timelines ("Spike-o-grams") at any point in the river.

G. Rempel gave an overview of the evaluation of potential strategies (TM #6) at the beginning of Day 2. These topics were discussed jointly at breakout session #3 in the morning of Day 2. This consisted of an overview of external and local policies; a presentation and discussion of compliance (reduction in volume of overflows, frequency of overflows; FC objectives and cases of GI) versus cost (as prescribed on Figure 5-1 and Figure 5-3, TM #6); and finally presenting an outline of potential CSO management strategies which would form the basis of Phase 3 analysis.

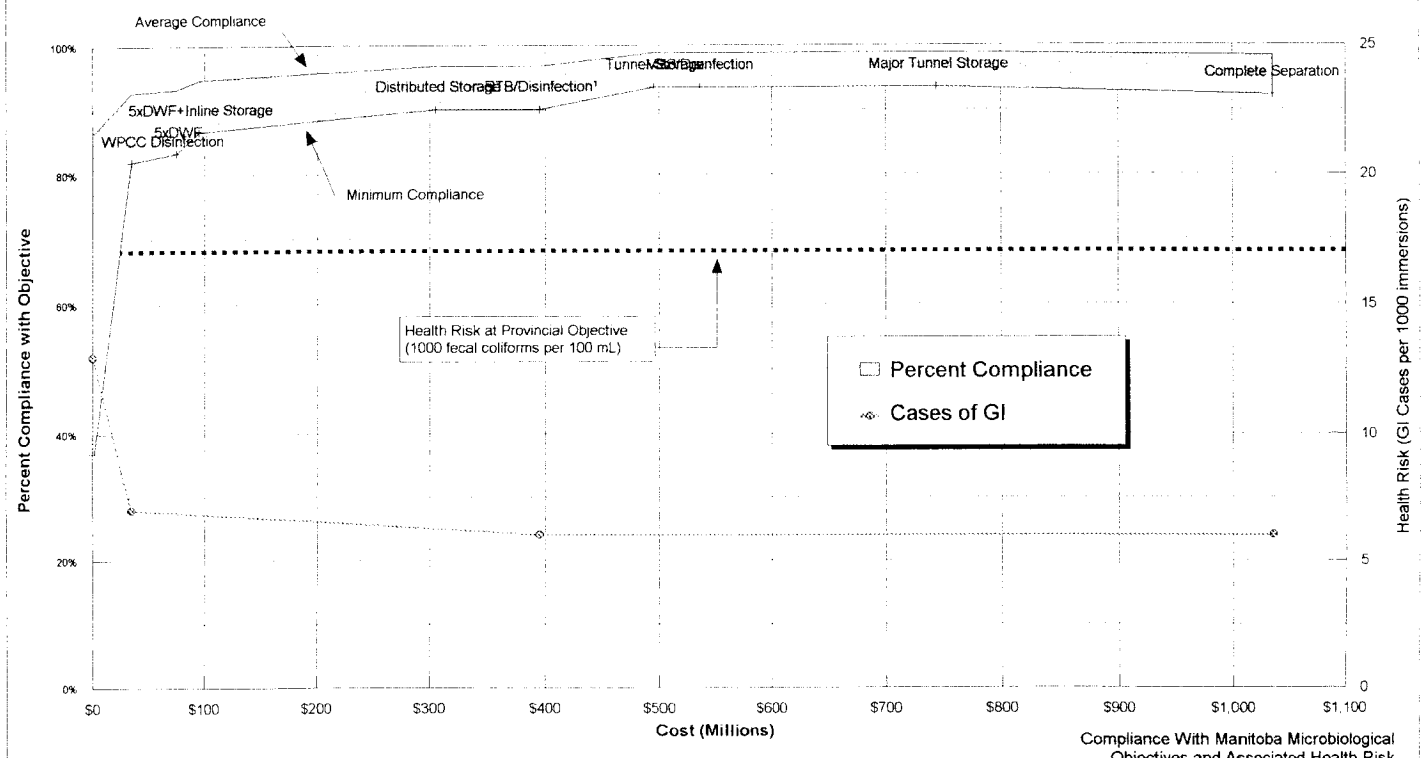
Questions developed and perspectives of the participants which will have to be addressed in Phase 3 were developed in Breakout Session No. 3. The results are summarized below under each of the two topics.

Compliance with 200 Fecal Coliforms per 100 mL Objective for Different Control Scenarios



1 Average Compliance is the average compliance for all 14 monitoring stations throughout the Study Area reaches
2 Minimum Compliance is the lowest compliance frequency of the 14 stations

Compliance with 1000 Fecal Coliforms per 100 mL Objective for Different Control Scenarios



1 Average Compliance is the average compliance for all 14 monitoring stations throughout the Study Area reaches
2 Minimum Compliance is the lowest compliance frequency of the 14 stations

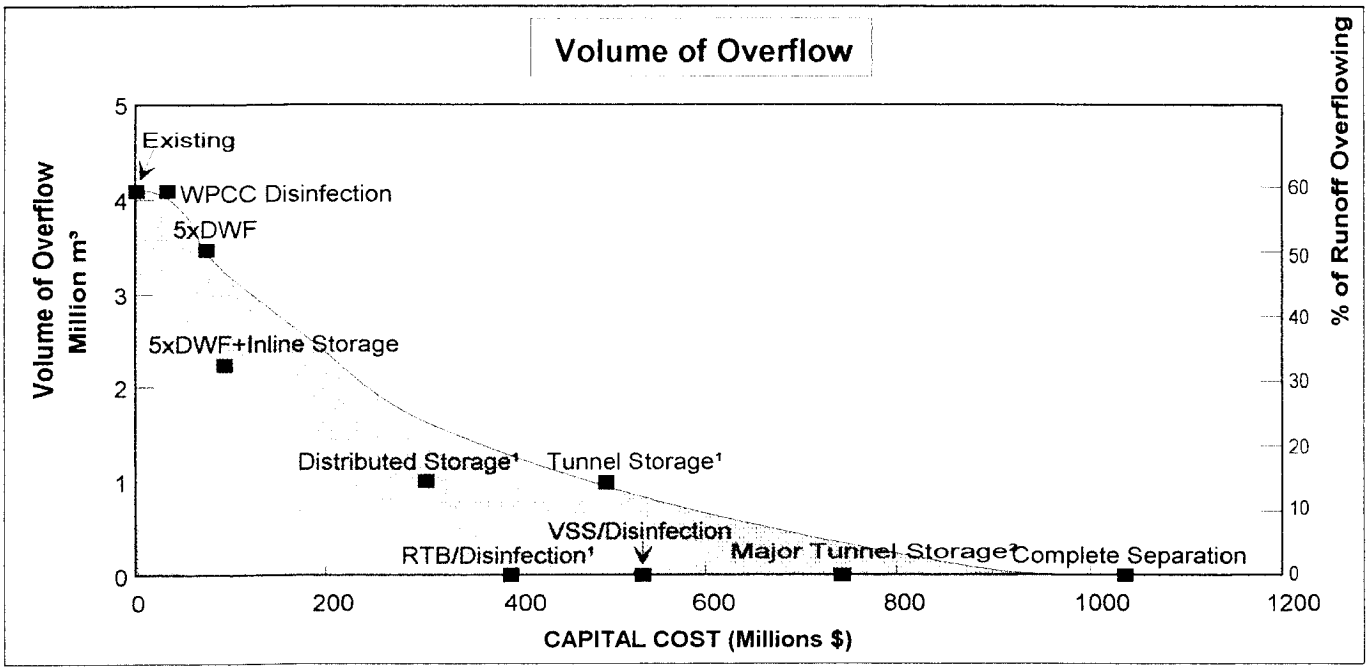
Compliance With Manitoba Microbiological Objectives and Associated Health Risk

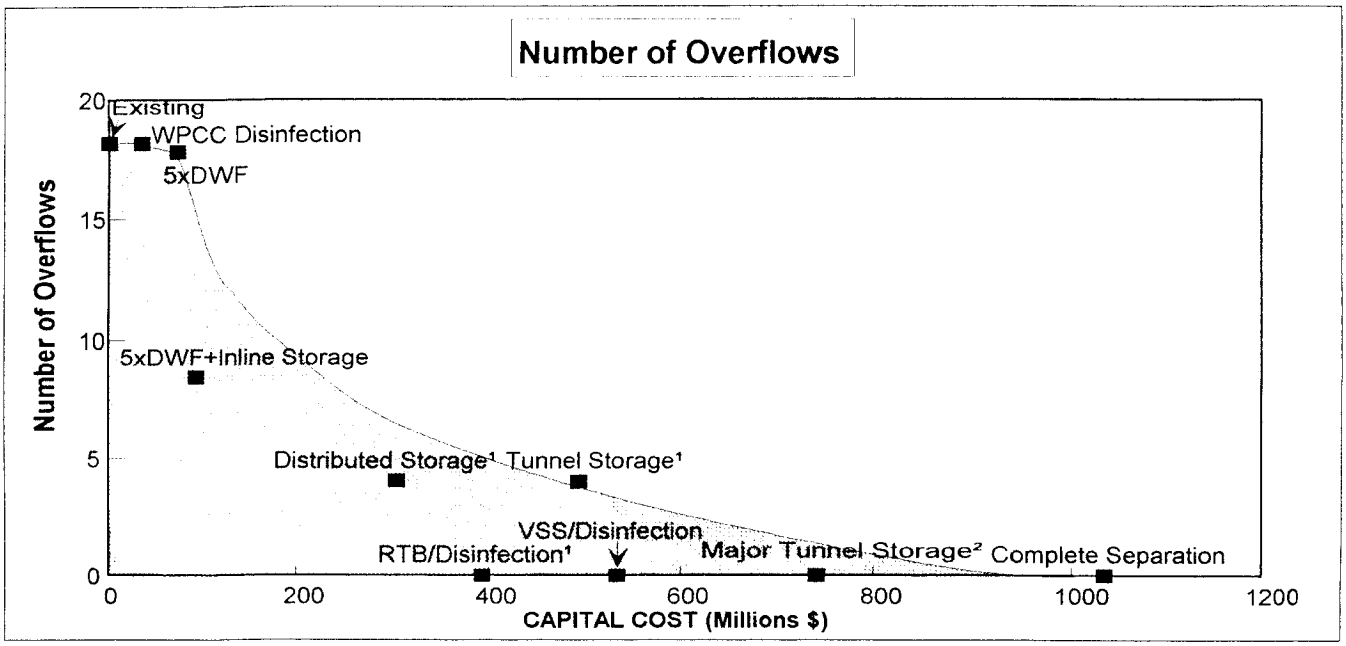
Figure 5-1 (TM #6)

CSOs UNDER DIFFERENT CONTROL SCENARIOS

Option		Description	Volume of Overflow		Number of Overflows		CAPITAL COST	
			Million Cu. M.	% of Runoff	Average of Districts	% of Existing	Option Millions	Cumulative Millions
		Runoff	6.96	100%				
		Existing	4.09	59%	18.2	100%	$0	$0
1a	DWF	DWO Correction	4.09	59%	18.2	100%	$2	$2
1b		WPCC Disinfection	4.09	59%	18.2	100%	$33	$35
2a	System	5xDWF	3.47	50%	17.8	98%	$40	$75
2b	Optimization	5xDWF+Inline Storage	2.25	32%	8.4	46%	$20	$95
3a	Storage	Distributed Storage[1]	1	15%	4	22%	$210	$305
3b		Tunnel Storage[1]	1	15%	4	22%	$400	$495
3c		Major Tunnel Storage[2]	0	0	0	0	$650	$745
4a	Disinfection	RTB/Disinfection[1]	0	0	0	0	$300	$395
4b		VSS/Disinfection	0	0	0	0	$440	$535
5	Separation	Complete Separation	0	0	0	0	$1,000	$1,035
6a	Floatable	Trash Netting	2.25	32%	8.4	46%	$30	$125
6b	Control	Screening	2.25	32%	8.4	46%	$110	$205

Note: 1 Assumes 300,000m³ of Storage. Results are estimates Only
Assumes 1,000,000m³ of Storage. Results are estimates Only





numb-vol
01_files

Figure 5-3
TM #6

5.1 BREAKOUT SESSION NO. 3

5.1.1 Receiving Stream

- According to available data, WPCC effluent qualities (fecal coliform) appears to have improved, particularly with regard to the NEWPCC. Recent monitoring data confirms these improved concentrations. The reason for this improvement is not known, although plant upgrades are likely partly responsible. The importance of this effect to the CSO study will be assessed in Phase 3.

- Fecal coliform concentrations at the North Perimeter bridge (downstream of the NEWPCC) have also reduced over the last decade. This is very likely the result of the reduction in plant effluent concentrations.

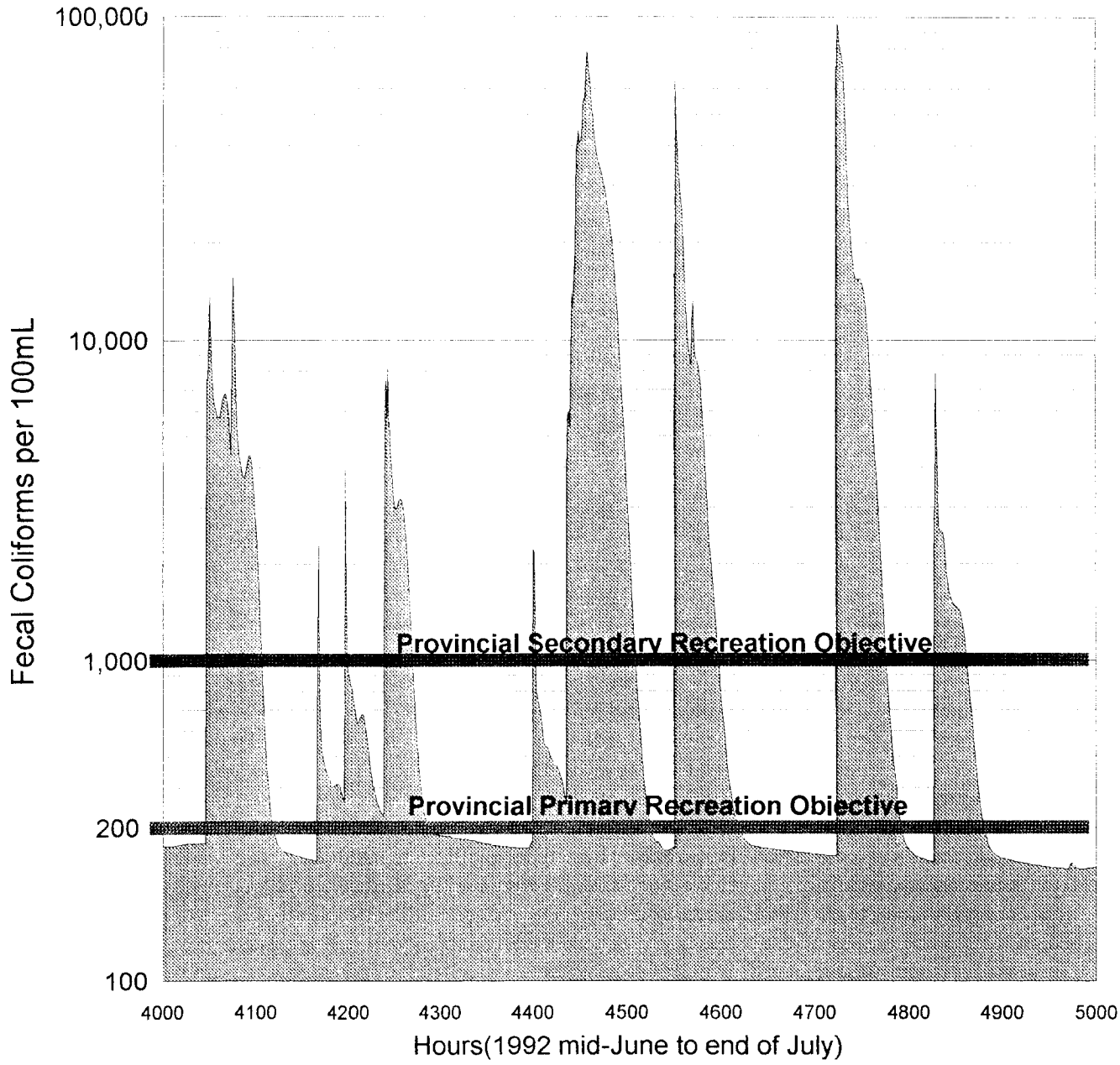
- As a result of the receiving stream analysis, it is obvious that a few dry weather overflows (DWOs) have had very significant impacts on long-term river water quality. It is very important that a plan be developed and executed to analyze and correct these various occurrences. (Phase 3)

- It was suggested that we review receiving stream coliform concentrations during the recent extended dry weather flow (i.e., the 1995 summer). The question was whether these fecal coliforms seemed to be lower than the long-term average over this period (Phase 2). (These data were reviewed after the workshop and confirm very low concentrations in the central area during the dry period.)

- It was suggested that people at the Forks or the mall events be asked about their concerns with regard to floatables in the river. Do we really understand the public perception in this regard? This could also be obtained through a telephone public attitude survey (currently not scheduled for Phase 3). (Phase 3 consideration)

- The hour-by-hour plot of fecal coliform concentrations during wet and dry weather (e.g., Figure 4-3 and Figure 5-2 from TM #4) is an excellent representation of river conditions and is a better representation of the public perspective than the average performance charts (e.g., Figure 4-5 and Figure 5-1 from TM #4). It was suggested that a further use of the former temporal graphs ("Spike-O-Grams") would be to identify the number of days

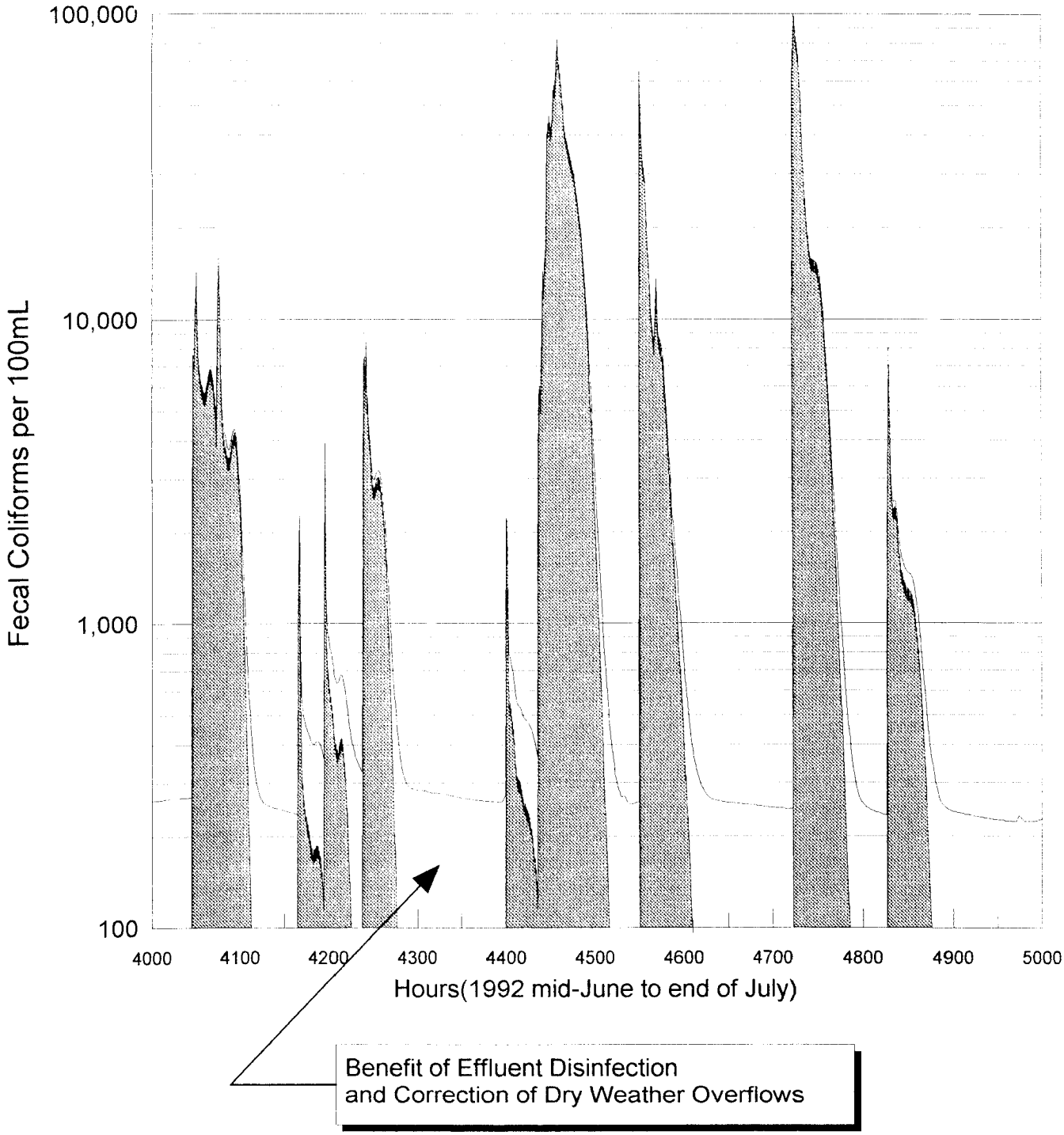
Predicted Fecal Coliform Levels at Redwood Bridge on Red River
In Response to Dry and Wet Weather Loadings for Existing Conditions



Predicted Fecal Coliform Levels at Redwood Bridge on Red River for Existing Conditions

Figure 4-3
TM #4

Predicted Fecal Coliform Levels at Redwood Bridge on Red River
In Response to Dry and Wet Weather Loadings for Existing Conditions



Benefit of Effluent Disinfection and Correction of Dry Weather Overflows Predicted at Redwood Bridge on Red River

Figure 5-2
TM #4

Assiniboine River

Adjusted WPCC Loadings and DWO

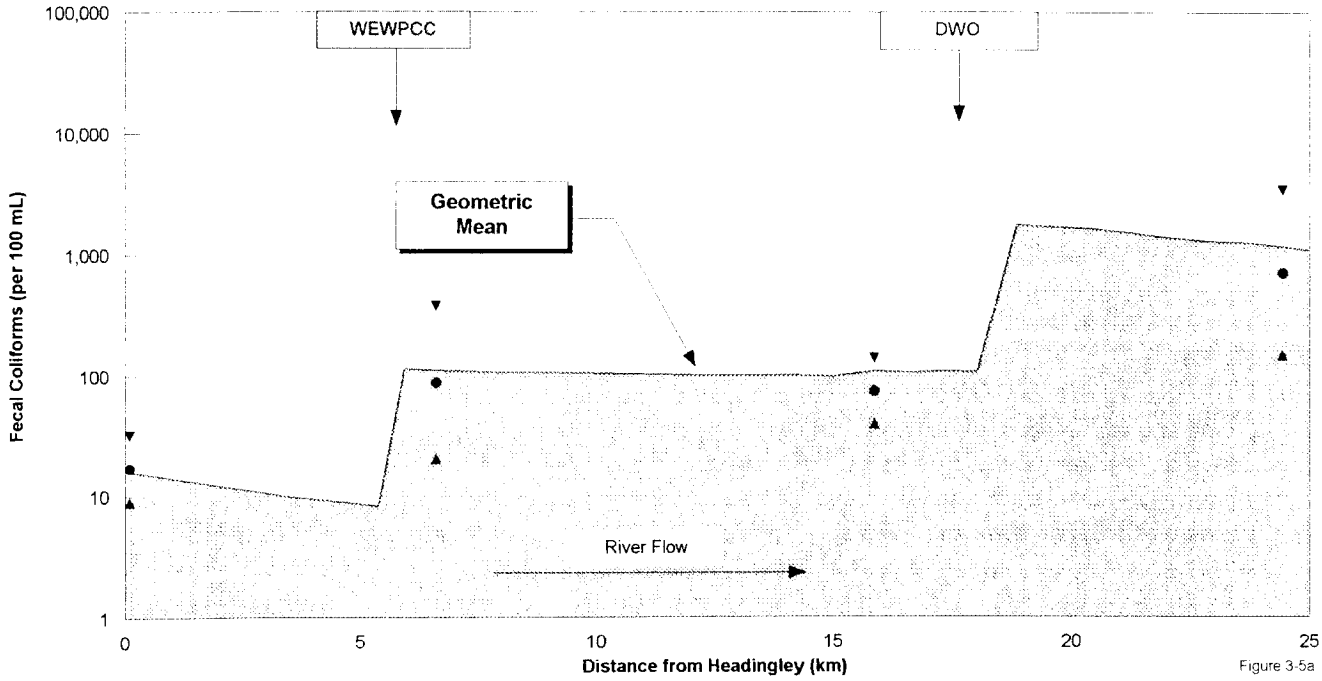


Figure 3-5a

Red River

Adjusted WPCC Loadings and DWO

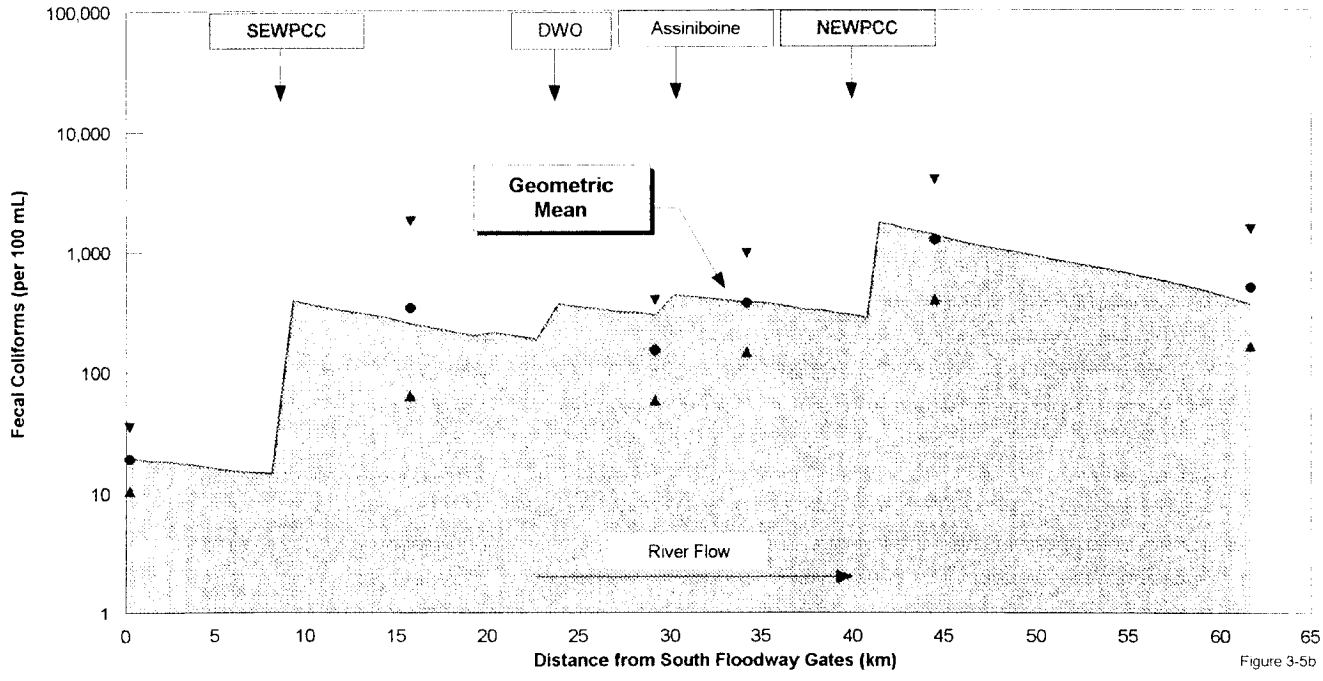


Figure 3-5b

Modelled Geometric Mean

Existing Conditions
Baseline for Estimating Benefits

Figure 4-5
TM #4

Assiniboine River

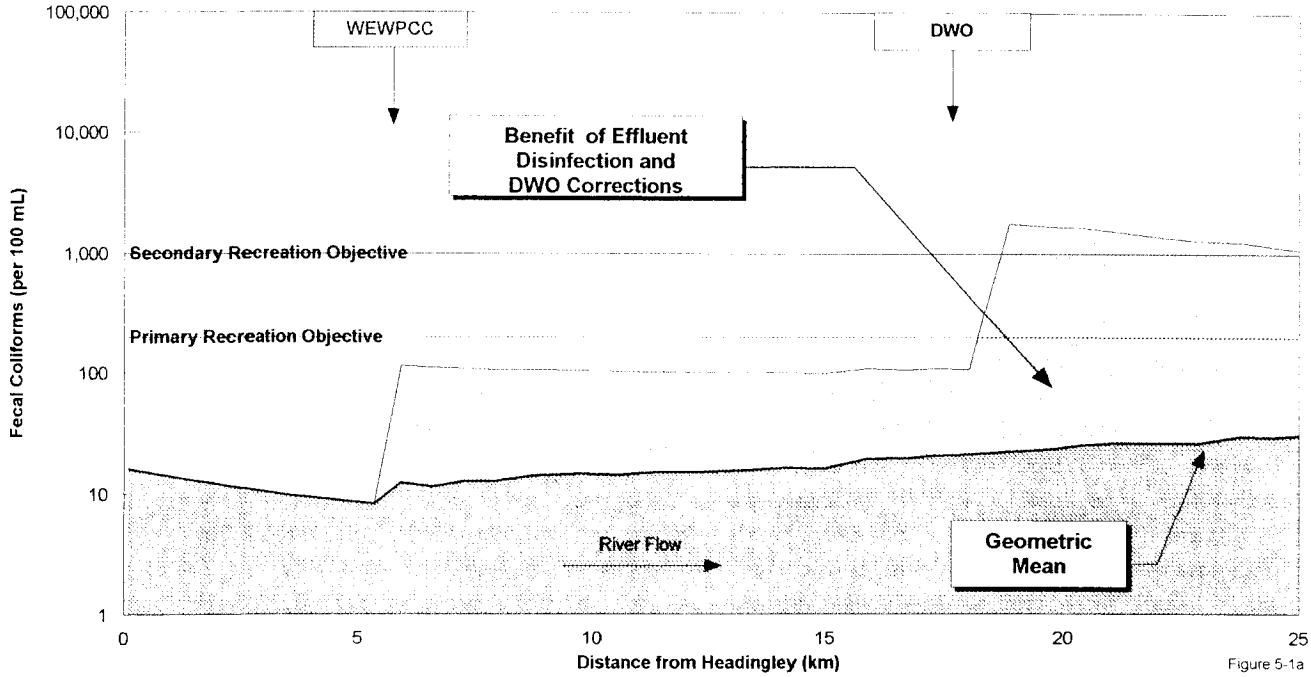


Figure 5-1a

Red River

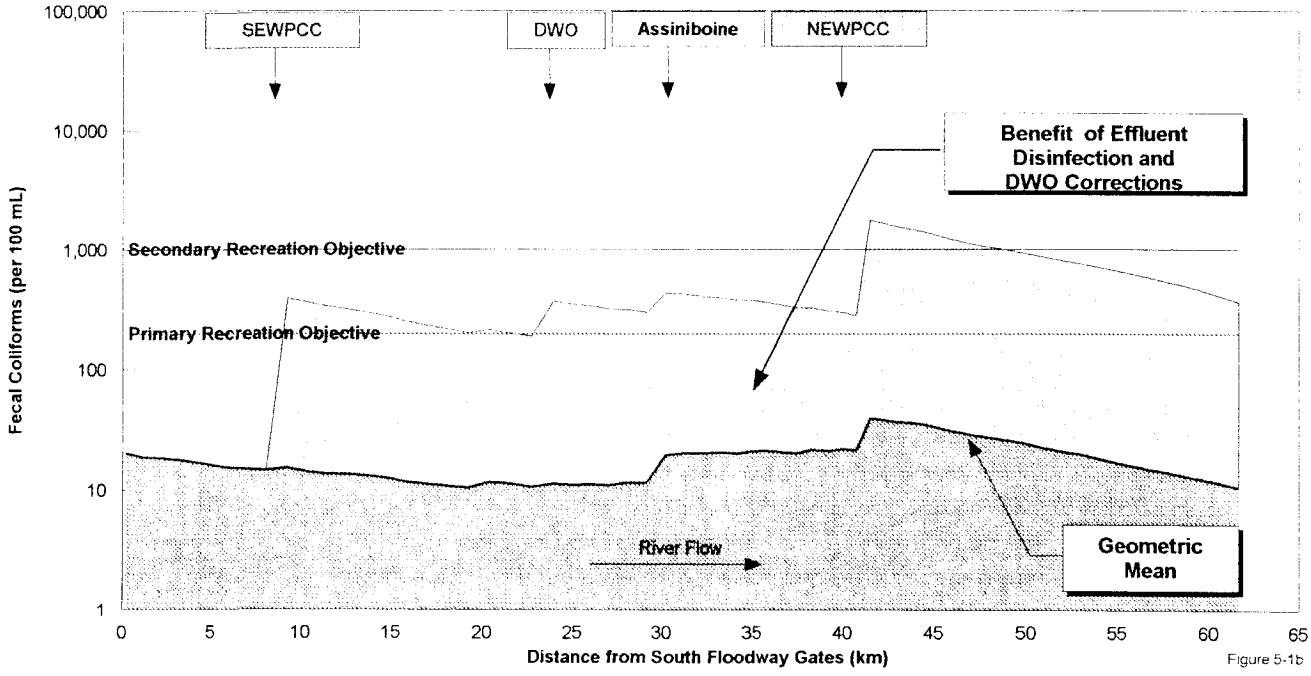


Figure 5-1b

Modelled Benefit of Effluent Disinfection and Correction of Dry Weather Overflows

Figure 5-1
TM #4

lost to recreation as a result of rainfall days. This could be done at one or more stations (e.g., Redwood Bridge, the Assiniboine River) and the calculation could be made for the days lost to recreation. This approach could be used to evaluate the impact of possible wet weather flow waivers of varying periods (6, 12, 24-hours) to determine whether such waivers would eliminate some, all, or none of the periods of high fecal coliform resulting from rainfalls. (Phase 2 follow-up)

- It was suggested that the study team develop categories for the various river reaches, such as discharge type and location, public/political sensitivity, recreation use, etc. (e.g., the Forks, south branch of the Red for water sports). (Phase 3)

- Other river quality issues that should be included in an overall discussion are:

  - oil and greases;
  - BMPs; and
  - public education (Phase 3).

- The question was raised as to whether or not we should include an allowance in the cost of storage tanks for cosmetic treatment, i.e., the cost to secure community acceptance. This is considered appropriate as costs are refined. (Phase 3).

- It was proposed that if we are going to do significant quantities of fecal coliform monitoring, we should consider the purchase of a coliform testing kit (e.g., Colilert™) as a potential cost-effective way to obtain the data. (Phase 3 consideration)

- The generalized question was raised as to "what is the key compliance criterion"? This was discussed by a number of groups with the following results:

  - Wheatley suggested that we not get too focussed on the EPA criteria of 4 overflows or 85% capture per year; it is arbitrary and only an interim step.
  - the overall group suggested that the City be pro-active, i.e., do not focus on comparison of their results to the various criteria established elsewhere but rather make a proposal to the regulator based on the results of the study. (Phase 3)

5.1.2 Potential Strategies

G. Rempel presented the study team's evaluation of potential strategies and concluded that only major tunnel storage and region wide sewer separation were being considered as being too costly to be practical candidates. During the group discussion, the workshop group as a whole recommended that these technologies be retained for continuing evaluation. Therefore, no control options will be removed from the continuing Phase 3 evaluation. A revised version of Figure 5-5 (TM #6) is attached. The changes include the Workshop results.

The break-out groups were asked to address the questions on page 26 of TM #6. Comments in this area included:

- DWF objectives should not apply to WWF. Experience has indicated that this cannot be done.

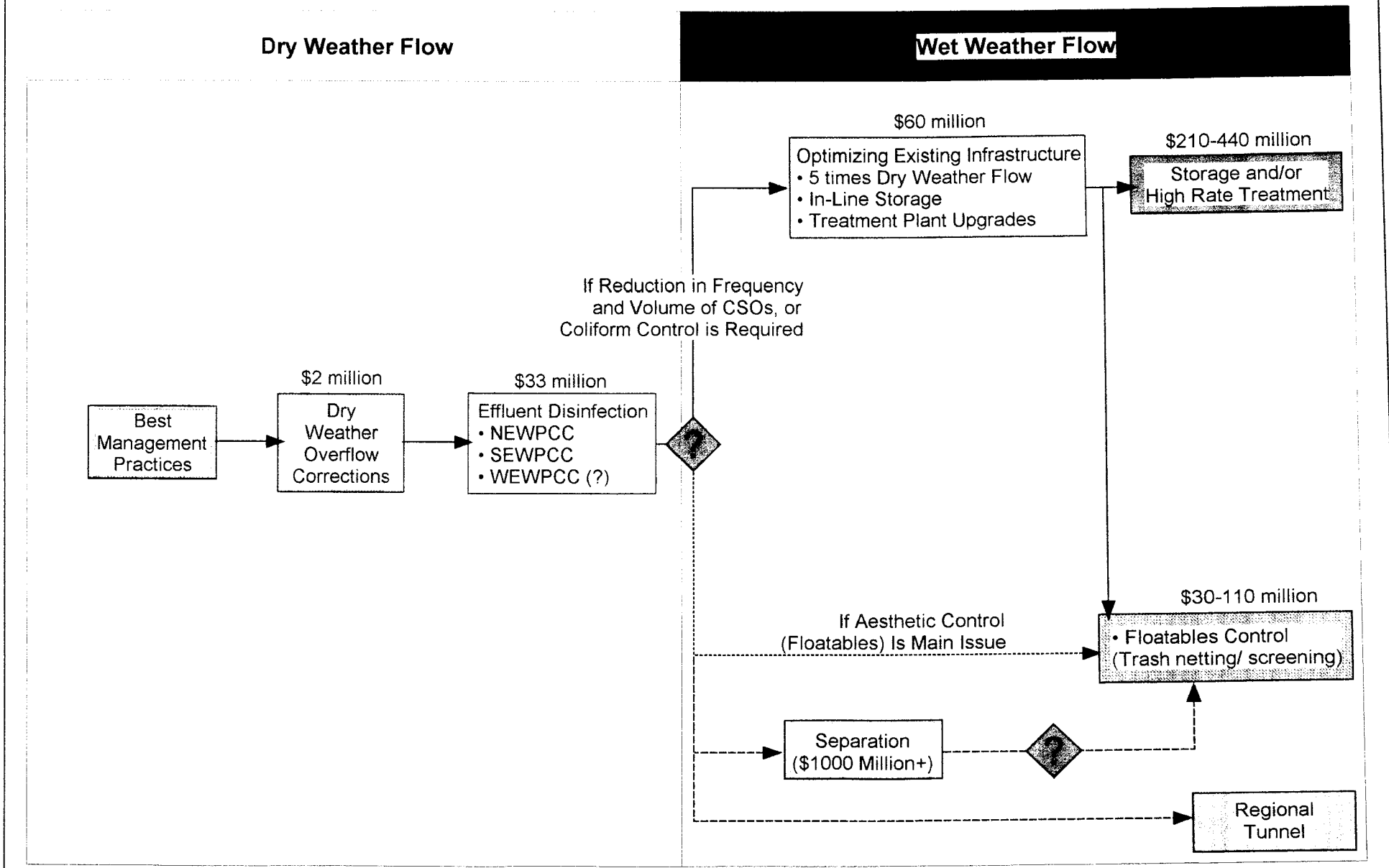
- The group suggested in answer to Question (3) that there should be WWF waivers. Subsequent analysis of the temporal coliform concentrations indicated that this may not provide much benefit in terms of compliance. (Phase 3 follow-up).

- Compliance with coliform objectives and the required degree of CSO control should be driven by public input. This input should be based on a clear understanding of the costs and the break point of the cost/benefit curve. EPA guidelines support the concept of the level of controls being shaped by public opinion.

- Floatables appear to be given a first priority in the United States. Given the CEC directive, it would seem that fecal coliforms have the major emphasis in Winnipeg.

- The group considered that it was not inherently necessary to protect all reaches of the river to the same degree. Compliance should be based on prioritized public use and exposure, e.g., the Forks and waterskiing. (Phase 3 consideration)

- It was suggested that we consider dealing with aquatic life issues involving the scientific community (e.g., Eva Pipp and fingernail clams). (Phase 3 consideration)



Potential CSO Management Strategies
Figure 5-5 (revised)
TM #6

s:\01_files\0510_wrd\38_cso\ptctrlpn.DRW

6.0 PERSPECTIVE ON WINNIPEG CSO STRATEGIES

A panel discussion took place with Wheatley, Moffa and Zukovs outlining their perspectives on CSO issues, regulatory trends, control trends, policy issues, all as applicable to the Winnipeg situation. The results of these presentations are summarized briefly below. The presentation was followed by a general discussion from the panel and the floor. The results of this discussion have also been summarized.

Nancy Wheatley Presentation

- Wheatley described the *Clean Water Act* (CWA) and EPA, CSO policy in the U.S. Some of her points include the following:

  - the CWA contemplates meeting technology-based standards and water quality standards. CSO controls will not typically meet water quality standards and therefore some reality or practicality must come into play;

  - the EPA considers the 9 minimum controls to be the near-term program. In-line storage is capital intensive, i.e., area-wide real-time control is not part of the 9 minimum controls;

  - the EPA policy recognizes that taking WWF to a central plant is better than end-of-pipe or high-rate treatment;

  - the EPA "presumptive" approach buys time (i.e., the meeting of 4 overflows or 85% capture per annum) but the proponent will still ultimately have to demonstrate compliance with water quality standards. Wheatley noted that the EPA considers a full twelve months of the year and not the recreation year;

  - the EPA policy encourages States to review their water quality standards for wet weather. Wheatley noted that State agencies are currently very reluctant to down-grade water quality standards;

- the CWA does not recognize cost-effectiveness. It only recognizes economic hardship which is a very stringent test;

- the EPA is showing flexibility in addressing CSO control programs. The current focus is on cost/benefit. Accordingly, many communities are reassessing CSO programs, even committed programs, with the intent of significantly reducing costs; and

- Wheatley suggested that the final Winnipeg CSO management strategy should be a program which can be expanded or phased-in.

Peter Moffa Presentation

- Moffa noted that Winnipeg has done a good job in laying out the control options. He considers bacteria control to be the first priority for Winnipeg and noted that DO and nutrients are typically not a problem elsewhere with CSOs and apparently not in Winnipeg.

- In Moffa's experience (primarily U.S.), floatables are the first priority but this may not be the case for Winnipeg.

- Moffa considers phasing to be a very important aspect of any CSO control strategy. Each phase should be followed by an evaluation step. Moffa noted that the water quality standards can change with time and therefore flexibility in the plan is important and necessary. The object in any case should be to protect the public. He believes that the phases could comprise the following:
  - interim phase - 5 years duration;
  - intermediate phase - 15 year duration;
  - long-term solutions - these solutions would be continually evaluated and refined in the first stages of the process and would likely be implemented over some years. The latter strategies would very likely be the most expensive and would only be done if warranted.

- Moffa believes that the biggest issue in the Winnipeg plan is cost and cost/benefit. The trend in the U.S. is for regulatory agencies to become more sensitized to cost realities and he expects the political climate may affect the regulatory position.

- Moffa noted that, to his knowledge, no State has developed WWF water quality standards.

George Zukovs Presentation

- Zukovs noted that 40 communities in Ontario have CSOs. Ontario policy is similar to the EPA. Early action required is much the same as the EPA 9 minimum controls. Subsequent action differs from the EPA in that Ontario requires the equivalent of primary sedimentation for combined sewage prior to overflow. Their definition of primary treatment is removal of 30% of BOD and 50% of suspended solids. Beaches are protected more strongly in Ontario, with the requirement being 95% of no violations from June 1 to September 30 and only allowing 2 or 3 events with less than 72-hour duration of non-compliance.

- Zukovs described the revised Cincinnati CSO plan. Its cost has been reduced from $2.2 Billion to approximately $350 Million. This cost serves a population of 1.4± Million people and some 260 outfalls, with 6 receiving waters. The new plan has been accepted by the public, regulatory authorities and environmentalists. Of the $350 Million, $60 Million is currently programmed. The total program is to be implemented in a 25-year period, with 5-year cycles. Although there is strong acceptance of the program there was apparently little public communication involved throughout.

Discussion

Much of the discussion of the Winnipeg CSO strategies had already taken place in earlier sessions. However, during the course of the discussion on public involvement, a number of points were made which appropriately fall into this heading. These have been included below.

- Weatherbe noted that, in the next phase of the study, we will be refining CSO control options. He believes that we have the tools and that these are already well-developed. He recognized that the costs can be improved and therefore suggested that we do not drop the regional tunnels at this point. (Continuing consideration in Phase 3)

- Weatherbe believes we should undertake treatability tests, i.e., solids settleability and UV disinfection or chlorination tests. (Consideration in Phase 3)

- Weatherbe suggested packaging the basement flood relief projects with CSO control. He suggested calling it a combined sewer "improvement program" and making it a policy that there will be no increase in the volume of CSOs through the implementation of the basement flood relief. In this regard, he believes that the City should re-write the policy on basement flooding with this commitment in mind. (Consideration in Phase 3)

- M. Parente noted that there is currently no policy on CSOs to which the City of Winnipeg must conform. Accordingly, we can only use the regulations of other agencies as guidelines. He suggested that as part of the management plan, we develop our own guidelines but don't be too lenient with respect to CSO control expectations.

- C. Rowney indicated that the development of a specific CSO management program will be a real challenge. He proposed that it would be useful to take a limited number of people (modellers and some experienced CSO people) and to brainstorm the situation through possibly a two-day working session in Phase 3. He believes this would be cost-effective and avoid extensive over-analysis. (Phase 3 consideration).

7.0 PUBLIC COMMUNICATION

G. Rempel and E. Sharp presented an overview of local experience in the area of public communications as well as the content of TM #5 (Public Communication).

Following this presentation a number of suggestions and comments were made from the floor. These are summarized below:

- Wheatley indicated that, in her experience, obtaining involvement of the public in CSO issues has been difficult and that there is no prescribed method or approach. She considered the mall concept to be a good one and concurred with our attempts at being visible to the environmental community. She also suggested that the mall show be taken to Selkirk, as one of the interest groups that otherwise might not come in contact with the study and its implications. (Phase 3 consideration)

- Wheatley suggested that the biggest challenge would be dealing with the WWF "spikes" in coliform concentrations and getting the regulators, the environmental groups, and the public to understand these dynamics.

- Wheatley noted that any strategic plan would have to be based on the presumption that the City of Winnipeg will do the first step, that is, address DWOs and best-management practices.

- Wheatley suggested that as part of the management strategy, the City should not pick a plan but rather lay out the options for public and regulatory discussion. She said that the City must not be perceived as supplying the solution but should be perceived as getting others to help. (Phase 3 consideration)

- Moffa noted that in his opinion one of the prime purposes of public communications is to arm the public so that they can read any editorials critically.

- Moffa suggested that we confirm the degree of interest of the public in gross solids and floatables issues through intensive polls and surveys. He added that we might quantify the problem through installation of floating booms or other in-river devices at the end of an LDS and a combined sewer outfall. The purpose of these efforts would be to determine whether or not gross-solids and floatables are an issue. (Phase 3 follow-up)

- Moffa noted that E-coli may be a better indicator of fecal contamination.

- Moffa and Weatherbe reiterated that we should take advantage of every opportunity to put the CSO issue in front of the public. In this regard, Moffa suggested making a film of the targeted plan for circulation among the media (consideration later in Phase 3).

- Zukovs believes that the technical approach we were using is sound and that the study is intensive. He is not concerned about the technical issues. He believes we are not getting enough public profile and should consider a demonstration project to establish such a profile. This would promote public reaction. This was supported by Weatherbe who said that this might include a demonstration project for in-line storage, trash netting, and/or disinfection (i.e., high-rate treatment disinfectability). The latter could even be laboratory scale project and reported to the public. He believes that demonstration

projects are very visible and provide a good profile. In Weatherbe's opinion, public profile has been one of the major benefits of the Scarborough pilot test. (Phase 3 consideration - significant pilot testing has been allowed for in the CSO study program).

- Weatherbe reiterated his contention that we should be connecting with regulatory agencies sooner rather than later. This was affirmed by others who noted that we need acceptance from politicians, the public, and the regulatory agencies for a successful project (in progress).

- The Advisory Committee is considered to be perhaps too limited in scope, i.e., it is composed entirely of bureaucrats. It was suggested that we should consider a bigger constituency. This will be reviewed during Phase 3.

- The suggestion was made that for the mall exhibits we prepare a mock-up of a water bill both before and after implementation of the CSO recommendations. This would put the real cost of CSO control into perspective. (Phase 3 consideration, when timely)

8.0 PHASE 3 CONSIDERATIONS

G. Rempel had prepared a series of overheads which indicated outstanding activities which would need to be addressed in the Phase 3 study. This was followed by a group discussion during which additional matters requiring follow-up were added. Rempel's discussion and the subsequent additions are provided below in point form.

D. Morgan discussed the use of wet weather flow interception rates as a basis for the sizing of CSO controls. This is discussed in detail on pages 63 to 65 of TM #3. The point is that interception rates are currently selected as being a multiple of DWF, whereas, for the objective of controlling overflows, a more appropriate selection would be based on district-specific wet weather flow or runoff. The point is illustrated in Figure 8-3 (TM #3), a plot of runoff versus dry weather flow which demonstrates no co-relation and Figure 8-4, a plot of number of overflows versus WWFIR, which shows a good co-relation. This approach will be considered further in Phase 3.

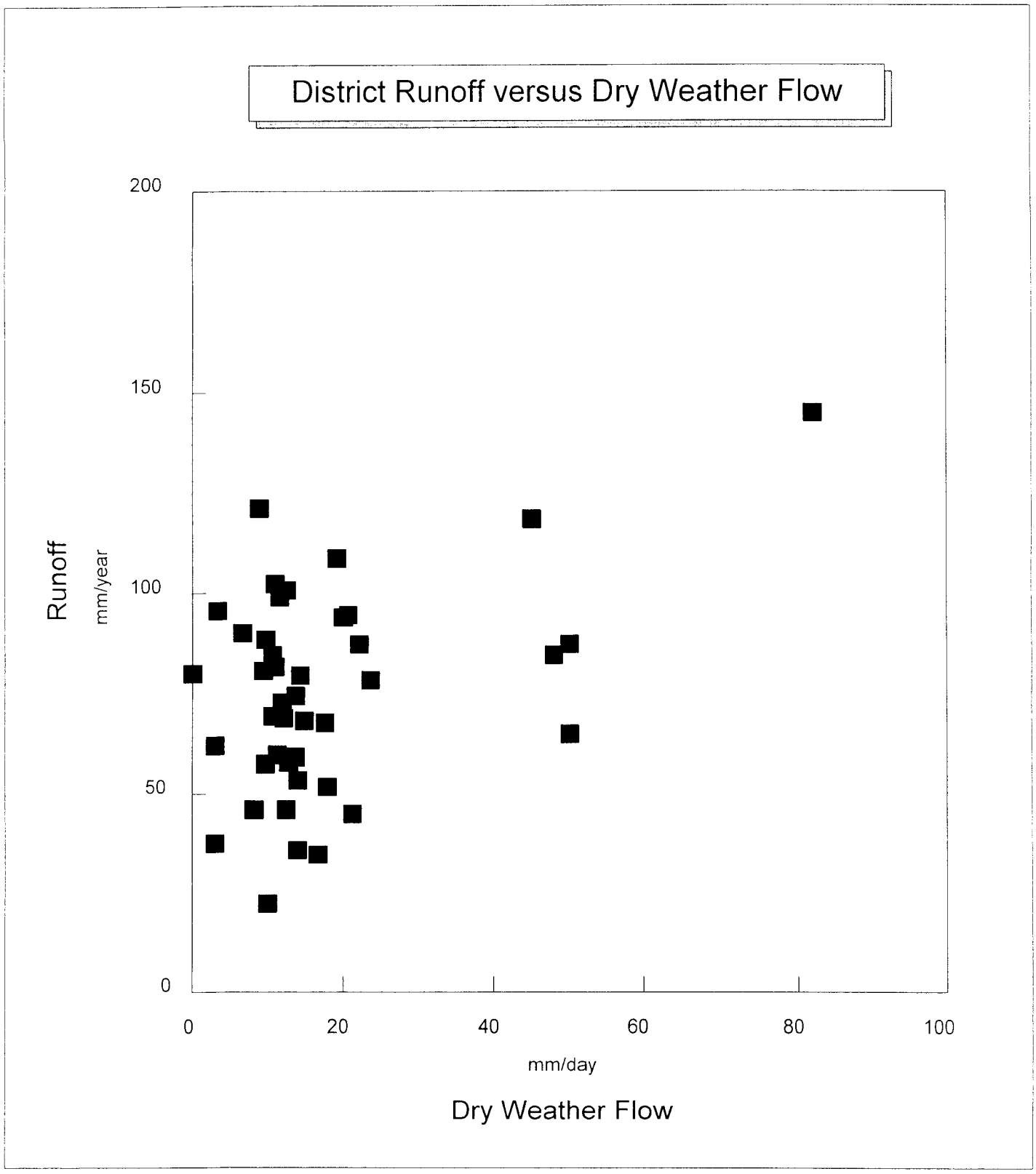


Figure 8-3
TM #3

rundwf
pw/sewer

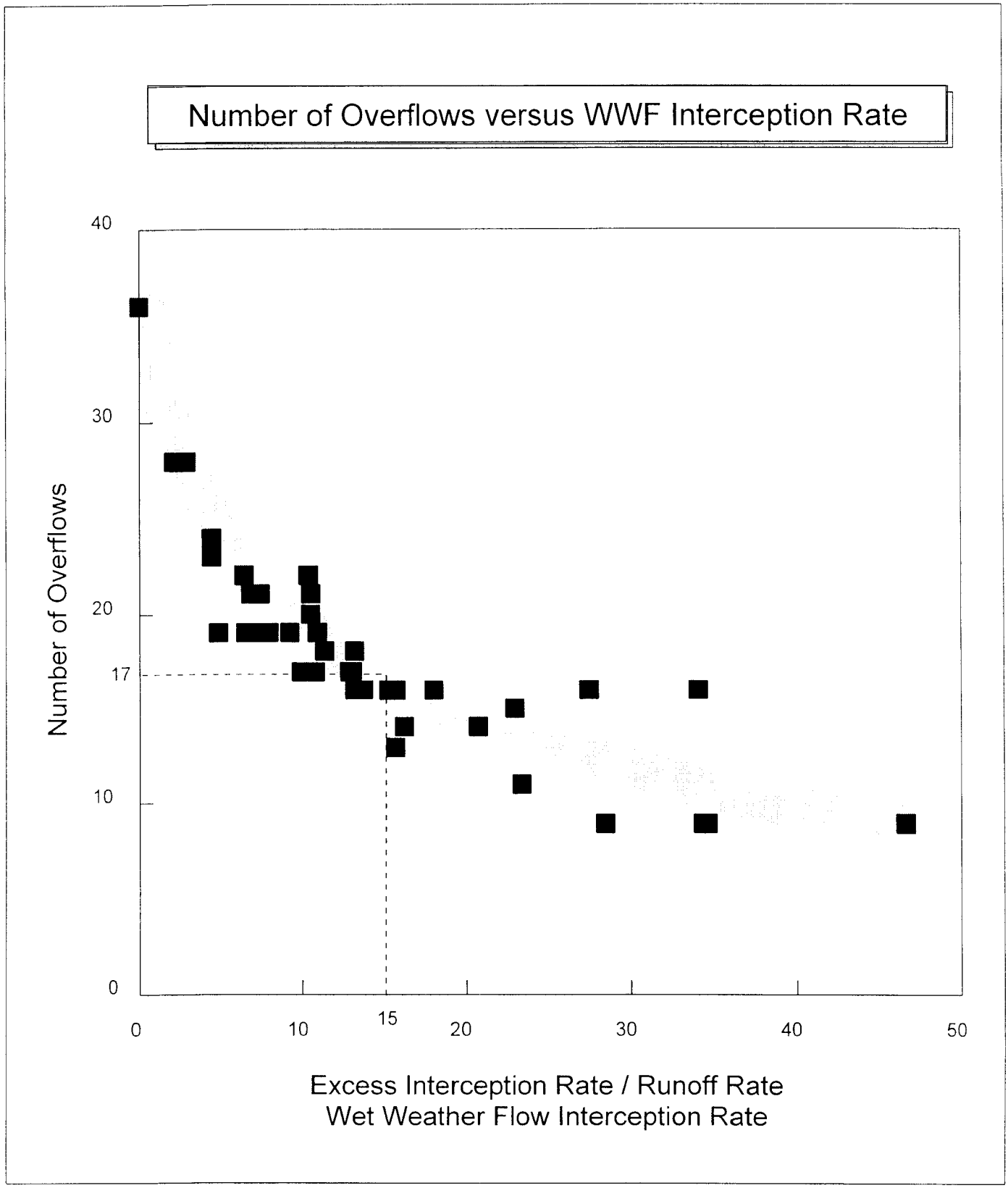


Figure 8-4
TM #3

ovflo
pw/sewer

8.1 PHASE 3 DIRECTION

The following points are made under the headings of the various workstreams.

Problem Definition

- Re-run 1992 rainfall (infill AES data, the City data). On completion of the Phase 2 analysis it was discovered that two rainfalls had not been reported. This did not affect the conclusions but did affect the specific modelling results.

- Check runoff bookkeeping, consider modelling specific storm and comparing it to NEWPCC flow.

- Runoff model adjustments
  - additional FAST alarm data (1992)
  - model sensitivities for specific parameters
  - specific districts (in response to new information)
  - improved DWF (adjust for gauged data)

- Simulate candidate control options
  - storage
  - high-rate
  - etc.

- Select WWF interception rate
  - district-specific definition of appropriate runoff/interception rate

- Review SSO loadings
  - revise coarse regional model in response to additional information (upgrade FAST alarm data and incorporate interceptor monitoring results)

- Provide direction on possible target areas, e.g., the south leg of the Red or the Forks.

- Incorporate monitoring results
  - CSO districts
  - LDS (volume, EMCs)
  - WPCC (EMCs)
  - FAST alarm data
  - sewer gauging data
  - seasonal DWF variations

- Refine CSO loading perspectives
  - representative year
  - long-term simulation
  - define benefits (reduced number and volume of overflows)
  - regulatory perspective, e.g., EPA draft CSO Policy (presumptive).

Interceptor Infrastructure

- Address DWO corrections
  - Assiniboine River
  - Red River

- Assess FAST alarm data effectiveness, particularly with regard to overflow detection, and where necessary adjust the alarm device so that indeed it reflects incipient overflow conditions.

- Evaluate Main interceptor restrictions
  - develop dynamic model with interception points and trunk sewers
  - consider vortex valves/hydro-breaks at gravity interception points

- Calibration of Main interceptor model
  - NE and NW interceptor data
  - level data (NEWPCC and main interceptor)
  - improved DWF (from gauged data)

- Assess cascading CSO system (to SEWPCC)

- Review the need to model the SE and WE interceptors, primarily with the aim of identifying I/I and SSO considerations.

- Model specific district applications of control facilities (design events)
  - detailed hydraulics
  - basement flooding protection
  - hydrograph response time (Clifton monitoring data).

- Develop area-wide Interceptor/District control combinations

Treatment

- Assess effects of increased WWF and NEWPCC
  - pumping
  - screen/grit
  - primaries
  - outfall
  - solids handling
  - evaluate the need for advanced treatment in primary clarifiers

- Conceptualize WWF expansion at NEWPCC
  - increased treatment, and
  - dewatering system WWF storage

- Consider district transfers to SEWPCC/WEWPCC (as required)
  - consider possible interconnection between the Main and SE interceptors

- Refine EMCs
  - influent
  - DWF effluent
  - WWF bypass

- Develop cost estimates of modifications or appropriate plant expansions

- Disinfection flow scenarios at the WPCCs

Control Alternatives

- Evaluate district-specific characteristics re: the Candidate Control Options
  - available land
  - flood pumping station use
  - general receiving stream sensitivity
  - river use
  - develop conceptual layout of storage/high-rate treatment (with flood pumping stations) at selected districts

- Review specific district applications
  - land-use
  - constraints/opportunities

- Storage (in-line/near-surface tanks/tunnel sewers)
  - dewatering capability between storms
  - multiple-year simulation
  - operating considerations
  - district-specific assessments
  - experience elsewhere
  - environmental/land use considerations

- High-rate treatment
  - RTB
  - VSS
  - UV disinfection
  - consider the potential for screening followed by high-rate disinfection
  - design criteria
  - experience elsewhere
  - capital and operating costs
  - environmental/land use considerations

- Assess utility of Flood Pumping Stations (existing infrastructure)

- Regional tunnel
  - review the tunnel sizing based on long-term runoff record

- Check treatability of CSO flows
  - settleability and characterization
  - disinfectability

- Phase 3 will consider recommending types of source control as part of BMP considerations in relief studies, e.g., flow slippage in new relief systems.

- Integration with relief/rehabilitation program
  - oversize sewers for in-line storage
  - selective separation (bonus)

- Conceptual area-wide combinations of district-specific control options

- Pilot demonstration program
  - in-line storage (1996?)
    - Clifton and others
  - trash netting
    - potential proposal from fresh Creek Technologies Inc.
  - check with P. Moffa
  - check with Boston (non-enthusiast)

- Monitor experience elsewhere
  - Scarborough high-rate treatment
    - VSS/UV disinfection
    - micro-filtration
  - Hamilton real-time control
  - Columbus Georgia
    - VSS/DAF, chemical/UV disinfection
  - New York
    - VSS
  - Richmond, Virginia
    - VSS results available on HIL and fluidsep

- Decatur, Illinois
  - full-scale RTB versus VSS (check with P. Moffa)
- Trash netting
  - New Jersey/New York
  - Boston
- check quality performance of in-line storage (P. Moffa has data)
- selected site visits

- Develop capital plus operating and maintenance costs

- Incorporate monitoring results (floatables)
  - local
  - develop program for 1996 (booms in the river at an LDS and a CSO outfall)

Receiving Stream

- Simulate WPCC effluent disinfection scenarios
  - DWF
  - PWWF
  - bypass

- Simulate existing conditions for representative year (reflect revised rainfall data)
  - review statistical calibration approach (i.e., skewness)

- Simulate preferred control options, i.e., revised stream loadings (volumes and EMCs) for representative year

- Assess receiving stream benefits
  - compliance (MWSQO)
  - EPA draft policy (demonstrative)
  - health risk

- Simulate area-wide combinations of control technologies
  - representative year

- Simulate reach-specific control strategies
  - south Red River leg
  - Assiniboine River
  - north Red River leg

- Simulate multi-year continuous water quality
  - high, low, range of river flow/rainfall

- D.O. monitoring downstream of NEWPCC

Public

- Increase public interest in river water quality and CSO control issues
  - feedback on Phase 2 results

- Phase 2 report distribution
  - "reader-friendly"
  - Works and Operations Committee
  - Advisory Committee
  - Special Interest
  - Public

- Progress report to Works and Operations (early 1996)

- Council seminar, approximately June 1996

- Presentation of Phase 2 results to Manitoba Environment

- Focus group

- Public newsletter/Info-advertisement?

- Advisory Committee, continue meetings

- Scientific/Special Interest, continue and increase current level of communication

- Public education/information displays/contacts

- Mall displays
  - mock-up water bill demonstrating the potential impact of CSO control on rates
- Media coverage

- Bill stuffers

- School program

- News Release/leak

Alternative Strategies

- Discuss Phase 2 results with Manitoba Environment

- Develop potential area-wide control plans
  - assess costs
    - capital and operating
  - assess benefits
    - volume and number of overflows
  - compliance
  - health risk
  - other characteristics
  - "trade-offs"
  - use spike-o-grams to demonstration effectiveness

- Describe financial implications
  - regional
  - utility
  - mock-ups

- Develop short-term/long-term alternative strategies

- Develop background for key issues

- water quality impacts
- effects on beneficial water use
- compliance with MSWQO
- CEC recommendations
- environmental policies
- aesthetics
- public perception

8.2 PHASE 3 WORKPLAN

The study group will review the Phase 3 Workplan (Figure 3-3 attached) and will update the activities and actions consistent with the results of the Phase 2 Workshop. They will also review manpower allocations and revise the budget as appropriate.

9.0 CLOSURE

G. Rempel thanked everyone for their active participation and contributions to the Workshop. He noted that a questionnaire would be circulated and the results tabulated. A sample of the questionnaire is attached in Appendix C. Rempel noted that he would welcome any and all comments, contributions, and constructive criticisms of the project in general and the Workshop in particular.

Except as otherwise noted, the foregoing comments and suggestions will be considered in the development of the Phase 3 Workplan.

APPENDIX A

NAMES	ADDRESS	PHONE AND FAX #
E. Sharp, P.Eng. B. MacBride, P.Eng. B. Borlase, P.Eng. A. Permut, P.Eng. P. Lagasse, P.Eng. M. Shkolny, P.Eng. D. Wardrop, P.Eng. T. Pearson D. McNeil	City of Winnipeg Waterworks, Waste & Disposal Dept. 1500 Plessis Road Winnipeg, Manitoba R3C 5G6	Direct lines: (204) 986-4476 986-4479 986-4435 986-3252 986-4434 986-4488 986-4469 986-4438 986-3245 Fax: (204) 224-0032
G. Rempel, P.Eng. N. Szoke, P.Eng. D. Morgan, P.Eng.	Tetr*ES* Consultants Inc. 603-386 Broadway Winnipeg, Manitoba R3C 3R6	Phone: (204) 942-2505 Fax: (204) 942-2505
R.J. Gladding, P.Eng. R. Foster, P.Eng. G. Steiss, Senior Technologist	Wardrop Engineering Inc. 400-386 Broadway Winnipeg, Manitoba R3C 4M8	Phone: (204) 956-0980 Fax: (204) 957-5389
D. Weatherbe, P.Eng.	Donald G. Weatherbe Associates Inc. 1352 Safeway Crescent Mississauga, Ontario L4X 1H7	Phone: (905) 896-4759 Fax: (905) 896-7954
G. Zukovs, P.Eng.	W_20 Suite 201 - 1 Port Street East Mississauga, Ontario L5N 4N1	Phone: (905) 891-2400 Fax: (905) 891-2554
M. Parente, P.Eng.	Gore & Storrie 7th Floor - 3660 Hurontario Street Mississauga, Ontario L5B 3C4	Phone: (905) 566-4666 Fax: (905) 566-4670
C. Rowney, P.Eng.	Parsons Brinkerhoff Suite 720 - 135 West Central Blvd. Orlando, Florida 32801 U.S.A.	Phone: (407) 872-3339 Fax: (407) 872-3336
R. Skrentner, P.E.	EMA Services Inc. 1970 Oakcrest Avenue St. Paul, Minnesota 55113 U.S.A.	Phone: (612) 639-5635 Fax: (612) 639-5600
N. Wheatley Technical Director	Sanitation District of Orange County 10844 Ellis Avenue P.O. Box 8127 Fountain Valey, CA 92728-8127	Phone: (714) 962-6957 Fax: (714) 962-6957
P. Moffa, P.E.	Moffa and Associates 5710 Commons Park P.O. Box 26 Syracuse, NY 13214	Phone: (315) 449-3010 Fax: (315) 449-0443

APPENDIX B

AGENDA FOR PHASE 2 WORKSHOP

HELD AT THE CANOE CLUB, 50 DUNKIRK DRIVE

DAY 1: 19 September 1995

8:00-8:30 **INTRODUCTIONS**

8:30-8:40 **1.0 REVIEW OF WORKSHOP OUTLINE, ETC.** **10 min.**
(G. Rempel)

8:40-8:50 **2.0 BACKGROUND REVIEW** **10 min.**

- CSO study objectives (Terms of Reference)
- CEC recommendations
  (G. Rempel)

8:50-9:30 **3.0 PHASE 2 "EXECUTIVE SUMMARY"** **40 min.**

Consultant presentation of highlights of Phase 2 analyses:

- How system works (interceptor/treatment) (R. Gladding)
- Control options - range reviewed (R. Gladding)
- Runoff loadings, current WWF perspective (D. Morgan)
- Receiving stream - how it responds (D. Morgan)
- Effects on stream (D. Morgan)
- Initial perspective on alternative plans (G. Rempel)

9:40-11:50 **4.0 EXISTING SYSTEM (RUNOFF/INTERCEPTOR/TREATMENT)** **130 min.**

- Technical Memorandum #1 "Problem Definition"
- Technical Memorandum #2 "Infrastructure Treatment"

These TMs will be reviewed in a presentation by the consultants (technical approach, key assumptions, results) -20 min., followed by a listing of questions/concerns from the floor - 15 min. These items would be tabled, for discussion in the Break-Out Session (4.3 below)

4.1 TM #1 "Problem Definition"

Presentation: N. Szoke - 20 min.
Tabling of issues/concerns: 15 min.

4.2 TM #2 "Infrastructure/Treatment"

Presentation: R. Gladding - 20 min.
Tabling of issues/concerns from floor - 15 min.

4.3 Break-Out Session

- Three working groups would discuss TM #1 and #2, using the tabled questions/concerns and other topics - 30 min.
- Groups would each appoint a spokesperson to report back to the workshop
- Each spokesperson would make a summary of their discussions
  3 x 10 min. = 30 min.

11:50-12:40 **LUNCH**

12:40-3:40 **5.0 CONTROL ALTERNATIVES (TM #3)** **170 min.**

5.1 Presentation of Technical Memorandum by consultant (regional model, representative year, FAST data) (D. Morgan) - 20 min.
Tabling of questions/concerns - 15 min.

5.2 Presentation of Control Alternatives and results by consultant - R. Gladding - 20 min.
Tabling of questions/concerns - 15 min.

5.3 Technology Comments

- Brief comments on CSO control technologies assessed
  in the report (5-10 min. each - 40 min.)
  - D. Weatherbe UV disinfection for WWF
  - P. Moffa - VSS
  - M. Parente - RTB/Storage
  - B. Skrentner - Inline storage (basic RTC)

5.4 Break-Out Session - 60 min.

- 3 working groups (30 min.) and report back
  (3 x 10 = 30 min.)

3:40-4:25 **6.0 RECEIVING STREAM (TM #4)** **35 min.**

6.1 Consultants presentation: N. Szoke - 20 min.
Tabling of issues/concerns - 15 min.

DAY 2: 20 September 1995

8:30-9:00 **INTRODUCTIONS**

9:00-10:00 **6.0 RECEIVING STREAM (TM #4) (cont'd)**

6.2 Break-Out Session
- 3 individual group discussions and report **60 min.**

10:15-11:50 **7.0 EVALUATION OF POTENTIAL STRATEGIES (TM #6)** **95 min.**

7.1 Consultant presentation: G. Rempel - 20 min.
Tabling of comments - 15 min.

7.2 Break-out Session
- 3 working groups - 60 min.

11:50-12:50 **LUNCH**

12:50-2:15 **8.0 PERSPECTIVE ON WINNIPEG CSO STRATEGIES** **85 min.**

- Panel discussion
  - brief presentations (10 to 15 min.) by three speakers (see below) followed by panel discussion, including questions from floor

Panelists

- N. Wheatley, G. Zukovs, P. Moffa - 40 to 45 min.
- Presentations could address external perspective on CSO issues, regulatory trends, control trends, policy issues, as applicable to the Winnipeg situation
- Discussion - Panel & Floor - 40 min.

2:15-2:55	**9.0**	**PUBLIC INVOLVEMENT**	**40 min.**
	9.1	Presentation by consultants on general local experience and this CSO study - G. Rempel/E. Sharp - 15 min.	
	9.3	Group discussion - 25 min.	
2:55-3:50	**10.**	**PHASE 3 DIRECTION**	**50 min.**
		• Lead presentation: G. Rempel 20 min. • Group discussion - 30 min.	
3:50-4:05	**11.0**	**WRAP-UP (G. Rempel)**	**15 min.**

/smc
manage/agenda

APPENDIX C

PHASE 2 WORKSHOP QUESTIONNAIRE

Please rate the following aspects of the CSO Workshop using the following scale:

A = Excellent, B = Good, C = Fair, D = Poor, E = Unacceptable

Aspects of CSO Workshop	RATING (please circle one)	COMMENTS
• **Technical Memoranda**		
- Content	A B C D E	
- Quality	A B C D E	
- Readability	A B C D E	
- Provided in adequate time for workshop	A B C D E	
• **Out-of-Town Participants**		
- Advance notice of Workshop date	A B C D E	
- Hotel arrangement	A B C D E	
- Hotel accommodation	A B C D E	
• **Workshop General**		
- Location	A B C D E	
- Workshop Facilities	A B C D E	
- Agenda	A B C D E	
- Lunch	A B C D E	
- Coffee and snacks	A B C D E	
- Visuals	A B C D E	
Was time scheduled reasonably?	A B C D E	
Did the presentations contain sufficient information to support planning level results?	A B C D E	

Aspects of CSO Workshop	RATING (please circle one)	COMMENTS
• **Workshop General (cont'd)**		
Would you suggest more or less presentation material (A = more, E = less)?	A B C D E	
Were the "break-out" sessions useful?	A B C D E	
Should we allow more time for discussions (A = more, E = less)?	A B C D E	
Was the Workshop adequately chaired	A B C D E	
Do you feel you had adequate opportunity to contribute to discussions?	A B C D E	
Would representation from the Province (e.g., Manitoba Environment) be beneficial at this forum?	A B C D E	
Was the room setup conducive to open discussions?	A B C D E	
Should there be more or less panel discussions (A = more, E = less)?	A B C D E	
Should the break-out sessions be of longer duration (A = longer, E = shorter)?	A B C D E	
Would you prefer more presentation from non-Winnipeg Consultants (A = more, E = less)	A B C D E	

Other Suggestions:

In the space provided below, please make suggestions on how we can improve the format for Phase 3 Workshop.