REFERENCE: DFO Page 1

ITEM:

The EIS refers to Construction Plan A and B. Please clarify the difference between these two plans.

RESPONSE:

The difference between these plans are that in Plan A the excavation proceeds from upstream to downstream (north to south), while in Plan B the excavation proceeds from downstream to upstream (south to north). Based on a risk erosion assessment Plan B was recommended in the Preliminary Engineering Report.

For more discussion on the various construction sequencing plans refer to page 4-36 to 4-38 of the EIS or Section 11.2 in Appendix B of the Preliminary Engineering Report.

REFERENCE: DFO Page 1

ITEM:

Construction plans are missing for certain components of the Project that may impact on fish and fish habitat. These include the proposed erosion control on the west bank of the Red River downstream of the floodway outlet, modifications to the Seine River syphon and overflow structure, recreational facilities, Floodway Outlet conduits, and Prairie Grove Road culvert replacement. Please provide.

RESPONSE:

Construction plans for the referenced structures will not be produced until Detailed Design phase, which is scheduled to begin this December. It is anticipated these drawings should be available by April/May 2005.

REFERENCE: DFO Page 1

ITEM:

Describe construction practices that will directly affect fish and fish habitat such as dewatering and installation of temporary instream works.

RESPONSE:

Detailed site-specific construction practices will not be available until the completion of final design and development of a refined construction schedule. The Environmental Protection Plan will outline these activities and provide site-specific practices to mitigate potential effects. Supplementary Filing Section 12.0 discussed this further.

REFERENCE: DFO Page 1

ITEM:

Describe operation for all project components that may impact fish and fish habitat.

RESPONSE:

EIS Section 4.0 “Project Description” provides a description of the project construction, operation and maintenance. Relevant components of these features are further described and explored in the respective assessments outlined primarily in EIS Sections 5.0, and 6.0. Further discussion on Operation is found in the Supplementary Filing Section 8.0 Floodway Operation.

REFERENCE: DFO Page 1

ITEM:

Describe maintenance for all project components (e.g., drain and channel maintenance; debris management at Seine River Syphon, Floodway Outlet conduits, and culverts; Inlet Control Structure gate de-silting; Low Level Crossing surface) that may impact fish and fish habitat.

RESPONSE:

MFA will be developing a detailed maintenance program for all Floodway and West Dyke infrastructure. It is understood that any maintenance activities affecting fish or fish habitat will require prior approval from DFO.

Main channel and outside drain maintenance will consist of periodic cleanouts and annual vegetation management through mechanical and chemical control (mowing and spraying). Chemical control will utilize registered products and licensed applicators. Chemical application programs require annual approval from Manitoba Environmental Approvals Branch.

It is proposed to install an improved trash rack on the inlet to the Seine River Syphon. It is anticipated this will decrease the need for the regular manual clearing of debris required at the existing structure. Detailed design of the trash rack will not be available until April/May 2005.

Inlet Control Structure maintenance includes an annual dewatering of at least one of the gate chambers (dependent on flow conditions) to evaluate the requirement for de-silting. If required, this activity is generally scheduled for the period just prior to freeze-up. It is anticipated any future de-silting operation will involve substantially less total silt volume and discharge rates than was involved in the fall 1999 emergency de-silting operation. TSS and turbidity monitoring (upstream and downstream of the structure) during that operation, was provided by North/south Consultants. Their report concluded the following: “Based on the historical range of TSS and turbidity at this location, and the flushing that will occur in spring 2000, no issues related to fish sensitivity are anticipated to result from this project”. Minor de-silting of the structure has been undertaken by departmental operations staff year since the 1999/2000 emergency de-silting, with no reported concerns from regulating agencies.

Information was requested related to maintenance activities at the Dunning Road low–level crossing. Maintenance of this crossing is the responsibility of the RM of St. Clements, and includes responsibility for "traffic safety". Maintenance of this crossing has been confined to restoration of the gravel traveled surface following periods of inundation, and as such has not been assessed as having affected the low-flow channel or its appurtenant fish habitat. Floodway Expansion is not anticipated to require modification of the design of this crossing at the channel base. Consultation with DFO will be required if concerns over this crossing persist.

Also refer to TAC/MFA-S-8.

REFERENCE: DFO Page 2

ITEM:

Describe deficiencies in available data pertaining to fish and fish habitat and plans to collect additional data.

RESPONSE:

The February 2004 Guidelines note that the EIS shall describe:

- In Section 6.2.4 "*Fish and Clam Habitat*" "*sufficient data on bathymetric mapping, groundwater upwelling, erosion and sediment patterns, substrates, habitat classification and quantification within the study area shall be required to provide a basis for predicting project effects and to quantify the effects of the Project on fish and clam habitat*".

- In Section 6.2.5 "*Fish and Clam Populations*" "*sufficient data regarding species composition and relative abundance, critical life stages and requirements of key fish species, movements and migration patterns, habitat use and fish quality … shall be provided to predict the effects of the Project on fish population in the study area"*.

Appendix 6 of the EIS describes and summarizes available information and outlines data deficiencies, both in the existing dataset and with respect to future survey efforts. The respective evaluations contained in EIS Section 6.0 applies the information which is relevant to the discussion of "*predicting project effects and to quantify the effects of the Project*" as described by the Guidelines. Data deficiencies relevant to the assessment are discussed and proposed monitoring plans provided in the "*Monitoring and Follow-up*" components of each sub-section in EIS Section 6.0.

REFERENCE: DFO Page 2

ITEM:

Identify groundwater upwellings in local creeks, rivers and drains that could potentially be impacted by the Project.

RESPONSE:

Existing groundwater upwelling on the floodway were noted in Appendix 6 of the EIS (Figure 6D-1 following page 6D-43).

The proposed floodway expansion will consist of widening the existing channel within the existing right-of-way, with no deepening of the channel bottom. Impacts to the existing groundwater piezometric levels are anticipated to be very minor and localized within the right-of-way limits of the Floodway Channel, such that no impacts are anticipated to the bedrock piezometric levels and groundwater upwelling at near by local creeks, rivers and drains.

REFERENCE: DFO Page 2

ITEM:

The EIS states for the purpose of the environmental assessment only two components of aquatic habitat will be considered, bottom substrate and aquatic macrophytes. This is unsatisfactory. There are many other important components to fish habitat such as woody debris, riparian vegetation, groundwater upwellings, channel morphology, and inwater structure.

RESPONSE:

The EIS Section 6.4.1.2 (pg 6-18) states,

> "*for the purpose of this environmental assessment, aquatic habitat refers to bottom substrate (gravel, silt, sand, etc.) and aquatic macrophytes (vegetation): both are key components that influence the presence and absence of aquatic life. Surface water quality, another key component of the aquatic habitat that affects aquatic life, is discussed in Section 6.3. Water flows and velocities and how these physical water characteristics may affect aquatic life as a result of the Project are discussed, where applicable, in Section 6.5 to 6.7".*

The EIS does not confine its definition of aquatic habitat with respect to the assessment as a whole to bottom substrate and macrophytes. The various aspects that make up overall aquatic habitat are discussed in all parts of Section 6.0. The above statement notes that for the purposes of the assessment conducted in Section 6.4 only, the environmental assessment has focused its evaluation on two aspects that were determined to be key components of aquatic habitat and did not complicate the assessment by duplicating evaluations outlined by other sections of the EIS.

The EIS also provides supplemental definitions and discussion of the various aspects of aquatic habitat provided in the "*Sources of Effects*" summaries in Section 6.3.1.2 9 (pg 6-7), Section 6.4.1.2 (pg 6-20), Section 6.5.1.2 (6-30) and Section 6.6.1.2 (pg 6-38). These summaries provide a broader perspective on the application of aquatic habitat and its various components to the assessment.

REFERENCE: DFO Page 2

ITEM:

Describe habitat used by commercially important clam species.

RESPONSE:

Currently in Manitoba, there is no clam commercial fishery. See also DFO/MFA-S-22.

REFERENCE:

Scaife, B. 2004. Telephone conversation between Jacqueline Taylor, Environmental Scientist, TetrES Consultants Inc., and Barb Scaife, Bio-Economist, Manitoba Conservation. November 9, 2004.

REFERENCE: DFO Page 2

ITEM:

Identify clams beds within the Red River and its tributaries that could potentially be impacted by the Project.

RESPONSE:

Refer to DFO/MFA-S-18 response.

REFERENCE: DFO Page 2

ITEM:

Provide a habitat map for the existing Low Flow Channel indicating substrate, depth, width, vegetation cover, and channel morphology.

RESPONSE:

The requested mapping will be provided as a component of the Fish Habitat Compensation Plan that will be developed for the project. This information will be submitted to DFO for their review in sufficient time prior to the onset of Project construction.

REFERENCE: DFO Page 2

ITEM:

Provide a detailed habitat map for the area of the Seine River to be impacted by the Prairie Grove Road culvert replacement.

RESPONSE:

EIS Section 4.6.2.2 "*CPR Emerson*" (pg 4-88 and 4-89) discusses the Seine River culvert crossing by the railway and the Prairie Grove Road. The EIS Section 6.0 does not incorporate an assessment of the potential effects of the proposed 10 m extension of the culvert at the Prairie Grove Road crossing of the Seine River. A description of the fish habitat in this area and the related effects and "no net loss" principle application will be provided as a component of the Fish Habitat Compensation Plans supplemental document outlined in EIS Section 6.6.3 (pg 6-39) and discussed further in response to DFO/MFA-S-15 and DFO/MFA-S-38.

REFERENCE: DFO Page 2

ITEM:

Provide detailed habitat maps of the areas to be impacted by the Project immediately downstream of the Floodway Outlet as well as along the west bank of the Red River.

RESPONSE:

The requested mapping will be provided as a component of the Fish Habitat Compensation Plan that will be developed for the project. This information will be submitted to DFO for their review in sufficient time prior to the onset of Project construction.

REFERENCE: DFO Page 2

ITEM:

Provide maps (plane view) or diagrams to show water levels on the Red River and its tributaries (including the Seine River upstream and downstream of the syphon) that occur under different operating scenarios.

RESPONSE:

Mapping of Flooded Area and depth profiles under different operating are presented in Supplementary Filing Section 8.0 Floodway Operation. Detailed Mapping for purposes of defining effects of the Project on fish habitat will be provide in the Fish Habitat Compensation Plan submitted to DFO in sufficient time prior to Project construction.

REFERENCE: DFO Page 2

ITEM:

Quantify the fish habitat that will be harmfully altered, disrupted, or destroyed by the various Project components. These components include but are not limited to the low-flow channel, outlet control structure, drains entering the floodway channel, and drains affected by West dyke construction. Provide a table, and drawings if necessary, summarizing the habitat losses and referencing their description in the EIS, technical appendices, and supplemental information package(s).

RESPONSE:

The EIS Section 6.0 specifically addresses each of the potential effects of the Project on fish habitat for each component noted, with the exception of the drains entering the floodway channel. EIS Section 5.6.4 (pg 5-43) notes that the alteration of the drainage outfalls to the floodway is not anticipated to result in substantive changes to area drainage patterns. Therefore, no effects were anticipated and the matter was not evaluated further.

EIS Section 6.6.3 (pg 6-39) and EIS Table 6.6-3 (pg 6-49) noted that the quantification of the fish habitat potentially disrupted cannot be performed until final Project design is completed. The Fish Habitat Compensation Plan will provide a detailed listing of all fish habitat effects and propose mechanism to achieve compliance with DFO policy.

This is discussed further in response to DFO/MFA-S-38.

REFERENCE: DFO Page 2

ITEM:

Information is needed on fish movements and migrations patterns. Provide an assessment of possible barriers to fish movement. Address the impact of the existing inlet control structure and gate operation on fish passage and fish populations.

RESPONSE:

The Supplementary Filing Section 3 provides a detailed description of the potential effects associated with the existing Inlet Control Structure operations under both active and inactive conditions.

Note that this evaluation does not alter the assessment conclusions as outlined in EIS Section 6.6.3.3 (pg 6-44) and EIS Section 6.6.3.4 (pg 6-47) regarding the absence of any active or inactive operational effects of the Project on fish movement or upstream passage through the Inlet Control Structure.

During construction, the potential frequency of active use of the Inlet Control Structure is anticipated to be temporarily reduced (see Supplementary Filing Section 8.3), potentially resulting in reductions in the degree of upstream fish passage impairment. The potential benefits of this effect are anticipated to be minor in magnitude and will not result in a significant positive impact with respect to fish movement in the Red River.

MFA is committed to investigating the possible impairment to fish passage by Inlet Control Structure operations (both inactive and active). Supplementary Filing Section 8.3 outlines the adaptive management approach proposed in order to mitigate adverse effects that might result from gate operation.

REFERENCE: DFO Page 2

ITEM:

Identify international fish stocks.

RESPONSE:

A review of fish movement studies is summarized in Appendix 6E. It is expected that all species present in the Red River have the potential to cross from Canada into the United States and vice versa, therefore all species listed in Appendix 6C, Table 6C-1, pages 6C-16 through 6C-21, have the potential of being a component of an international fish stock.

REFERENCE: DFO Page 2

ITEM:

Information is needed on clam dispersal mechanisms.

RESPONSE:

Currently, there is no known Manitoba based literature (published or unpublished) in the public domain on clam dispersal mechanisms. Available information has been described in the EIS, Section 6.6, pages 6-38 through 6-50 and indicates that:

> *"The Project is not anticipated to have any significant adverse effects on fish and clam populations."*

REFERENCE: DFO Page 2

ITEM:

Provide an assessment of fish mortality associated with the inlet control structure, outlet structure, Seine River syphon, and drop structures.

RESPONSE:

This issue is discussed in response to DFO/MFA-S-34 and TAC/MFA-S-33.

REFERENCE: DFO Page 2

ITEM:

Silver Chub (Schedule 1), Chestnut Lamprey (Schedule 3), and Bigmouth Buffalo (Schedule 3) are listed as Species of Special Conern in the federal ***Species at Risk Act SARA)*** and can be found in the study area. Describe known movements and migration patterns and habitat use of these SARA fish species.

RESPONSE:

Information regarding habitat use of COSEWIC/SARA-listed fish species potentially occurring in the Red River and Floodway Channel, including spawning time and habitat and habitat use of juvenile and adult fish, is provided in EIS Appendix 6C, Table C-1. Fish sampling within the Floodway Channel during 2004 (EIS Appendix 6D) did not reveal the presence of any COSEWIC/SARA-listed fish species, although they may occur in the Floodway Channel, particularly when the Red River flow is diverted into the Floodway Channel.

The movements and migration patterns of fish species that occur within the Red River and are listed as Special Concern (i.e., Silver Chub, Chestnut Lamprey and Bigmouth Buffalo) have not been extensively studied in the Red River. Some limited fish catch information exists at particular locations with in the Red River (EIS Appendix 6D; Stewart and Watkinson 2004).

REFERENCE:

Stewart, K.W., and D.A. Watkinson. 2004. The Freshwater Fishes of Manitoba. University of Manitoba Press.

REFERENCE: DFO Page 3

ITEM:

While Lake Sturgeon is currently not on Schedule 1 of ***SARA*** this species is likely to be designated as threatened in Manitoba in the future. It would be prudent of the proponent to consider this during the assessment.

RESPONSE:

Information regarding Lake Sturgeon habitat use, including spawning time and habitat and habitat use of juvenile and adult fish, is provided in EIS Appendix 6C, Table C-1. Fish sampling within the Floodway Channel during 2004 (EIS Appendix 6D) did not reveal the presence of Lake Sturgeon. Sturgeon may occur in the Floodway Channel, particularly when the Red River flow is diverted into the Floodway Channel.

As indicated within the EIS, Project impacts to the aquatic habitat (Sections 6.5.3 and 6.5.4) and fish, including the Lake Sturgeon (Sections 6.6.3 and 6.6.4), are not expected to be significant.

REFERENCE: DFO Page 3

ITEM:

Provide descriptions of the domestic and commercial fisheries as well as a more detailed description of the recreational fishery present in the study area.

RESPONSE:

The Red River is the largest sport fishery in Manitoba. Manitoba's Southern Fishing Division (which includes the Red River) has an annual fishing season that opens in May. Table 1 summarizes the results of a sport fish survey conducted in 2000 for the Red River and for Manitoba in total.

Table 1
Number of Fish Caught and Kept by Sport Anglers, Red River and Manitoba: 2000

	Red River			Total Manitoba		
Fish Caught	**By Residents**	**By Non-Residents**	**Total**	**By Residents**	**By Non-Residents**	**Total**
Walleye	315,324	35,757	351,081	3,705,609	1,996,911	5,702,520
Pike	34,376	3,073	37,449	2,257,610	1,922,515	4,180,125
Catfish	183,588	56,292	239,879	249,083	56,898	305,981
Perch	35,323	351	35,674	1,957,738	235,272	2,193,010
Other Species	471,167	24,528	495,695	1,282,804	243,818	1,526,622
All Species	1,039,778	120,000	1,159,778	9,452,844	4,455,414	13,908,258
Fish Kept	**By Residents**	**By Non-Residents**	**Total**	**By Residents**	**By Non-Residents**	**Total**
Walleye	124,773	10,686	135,460	1,346,226	323,632	1,669,858
Pike	5,892	451	6,343	443,811	76,577	520,388
Catfish	1,363	2,684	4,046	7,619	2,717	10,336
Perch	3,197	50	3,248	718,948	144,019	862,967
Other Species	54,126	2,305	56,430	274,827	24,128	298,955
All Species	189,351	16,176	205,527	2,791,431	571,073	3,362,504

Source: Manitoba Conservation 2004[1]
Note: Based on licensed sport fishing records.

[1] Manitoba Conservation. Angling in Manitoba (2000). Retrieved from: http://www.gov.mb.ca/conservation/fish/images/survey.pdf *Verified on* May 15, 2004.

For information on commercial fishing on the Red River in the Flood Study Region, please refer to the response to TAC-MFA-S-61.

During a conversation with a representative from Manitoba Water Stewardship, Fisheries Branch, it was indicated that there is a small domestic fishery on the Red River, but that it consists of a few individuals and is considered negligible compared to the recreational fishing that takes place in the Flood Study Region. (*Cann, Personal Communication*).[2]

With respect to clam harvesting, in 1991, Manitoba Natural Resources issued two experimental licences to harvest clams in the province. No licences have been issued since that time.[3] During a conversation with a representative from Manitoba Water Stewardship, it was indicated that there is currently no significant recreational, commercial or domestic freshwater clam fishery in the Flood Study Region. (*Cann, Personal Communication*).

[2] Personal Communication with Rob Cann, Provincial Angling Manager, Manitoba Water Stewardship, Fisheries Branch, Winnipeg, MB.
[3] Source: 1993 State of the Environment Report. Available: http://www.gov.mb.ca/conservation/annual-report/soe-reports/soe93/water.html

REFERENCE: DFO Page 3

ITEM:

Describe potential impacts to groundwater upwellings in local creeks, rivers and drains.

RESPONSE:

See response to DFO/MFA–S-7.

REFERENCE: DFO Page 3

ITEM:

List expected flow and depth at several points along the Low Flow Channel under various operating scenarios.

RESPONSE:

See Attachment DFO/MFA-S-24 which follows.

Additional Information on Water Levels in the Low Flow Channel
With the Existing and Expanded Floodway Channels
KGS Group
October 28, 2004

This document provides information describing the attached water surface profiles and flow duration curves for the summer flow conditions in the low flow channel for the Existing and Expanded Floodway Channels.

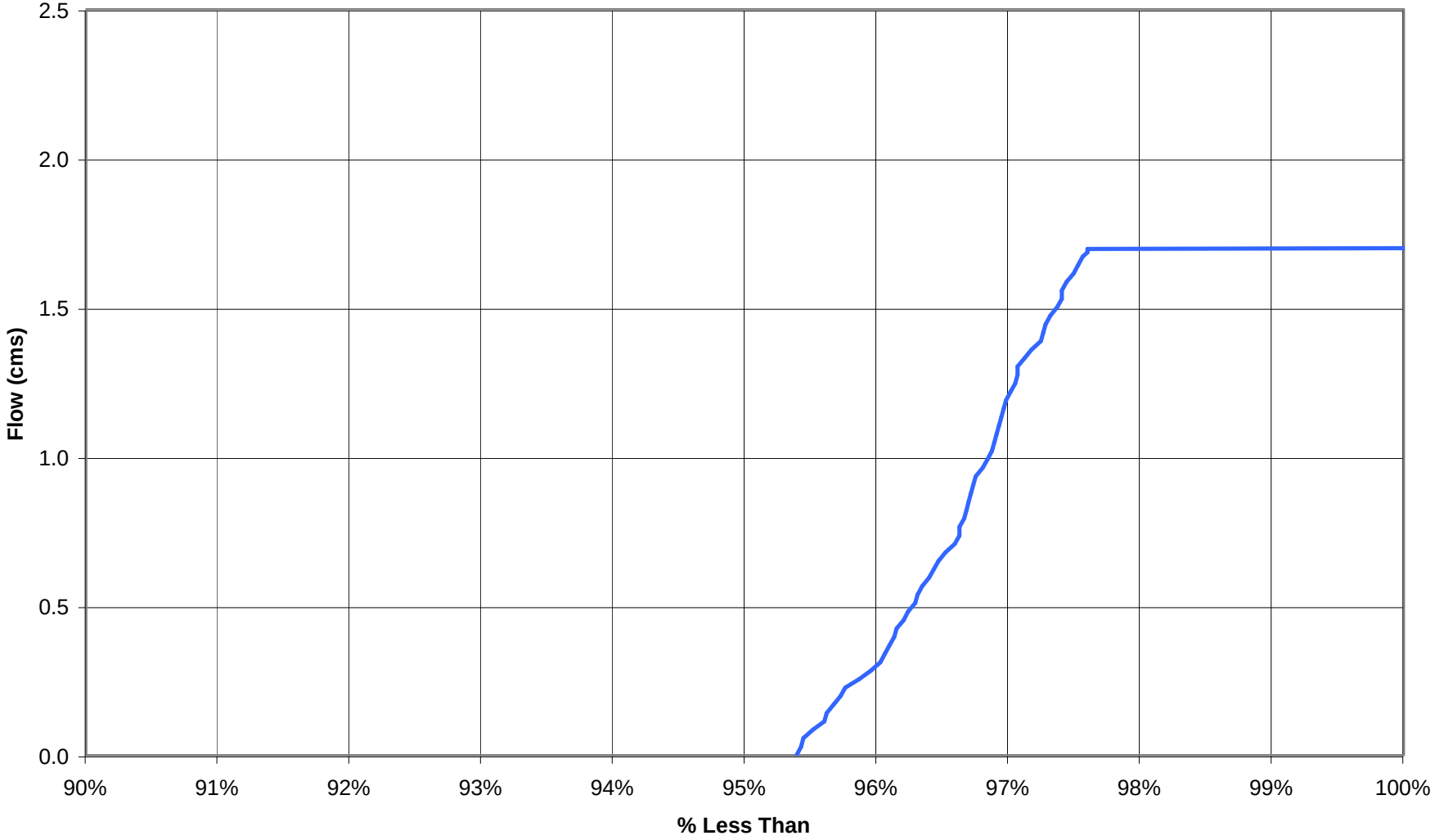
Flow duration curves (attached) were estimated for the flows in the Floodway during the summer period from June 1 to October 31. These flows were estimated based on the Water Survey of Canada recorded flows on the Seine River and the Cooks Creek. It should be noted that the duration curves are based on surface water flow only and do not account for local groundwater inflow into the Floodway Channel. The average local groundwater inflow to the Floodway, based on field flow measurements taken by KGS Group during the PDEA2 process, was estimated as approximately 2000 USgpm (0.11 m^3/s) in total over the length of the Flodoway.

The water surface profiles (attached) were estimated for both the Existing and Expanded Floodway channels for the following summer flow conditions:

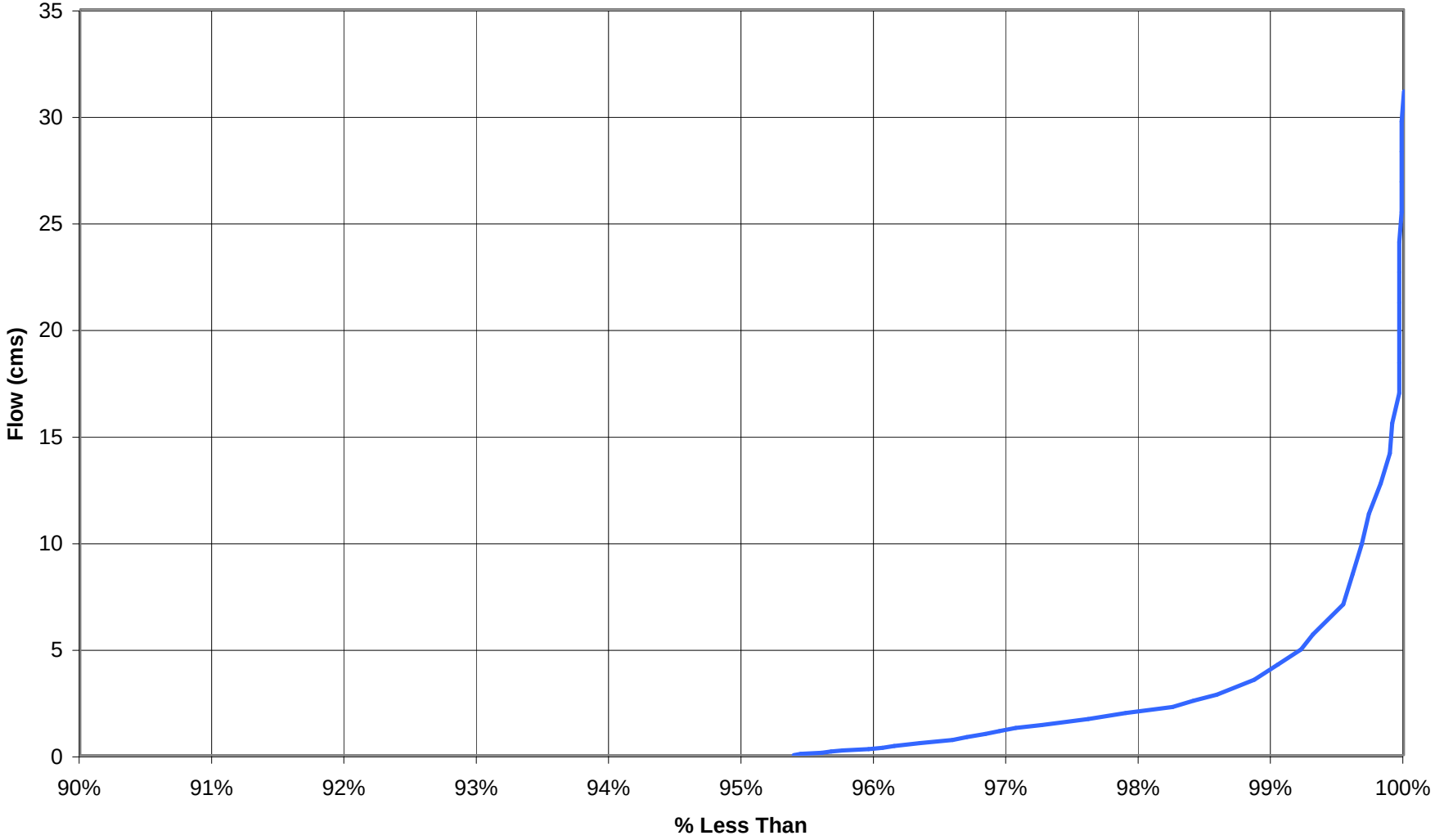
- 98% Flow (that is, the flow in the Floodway is less that this magnitude 98% of the time)
- 95% Flow
- 90% Flow
- 50% Flow
- 20% Flow

It should be noted that the water surface profiles were based on a summation of the surface flows as summarized by the duration curves and the estimated groundwater inflow. The groundwater inflow is represented as being additive to the Floodway uniformly between the CNR – Redditt Bridge and the Outlet Structure. The groundwater flow is estimated to be relatively constant at 0.11 m^3/s.

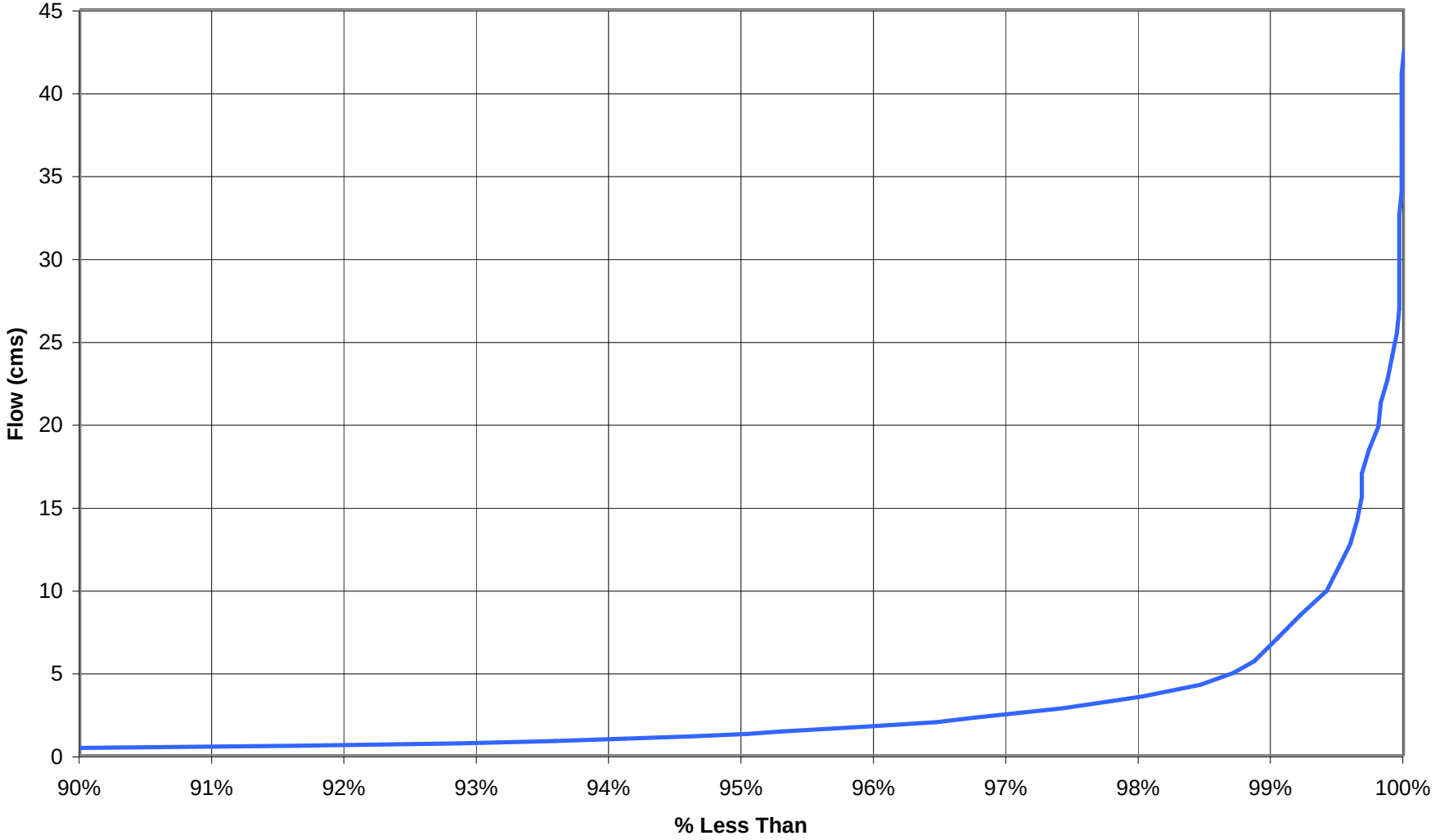
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 11 + 740 m - Downstream of Seine River Siphon)



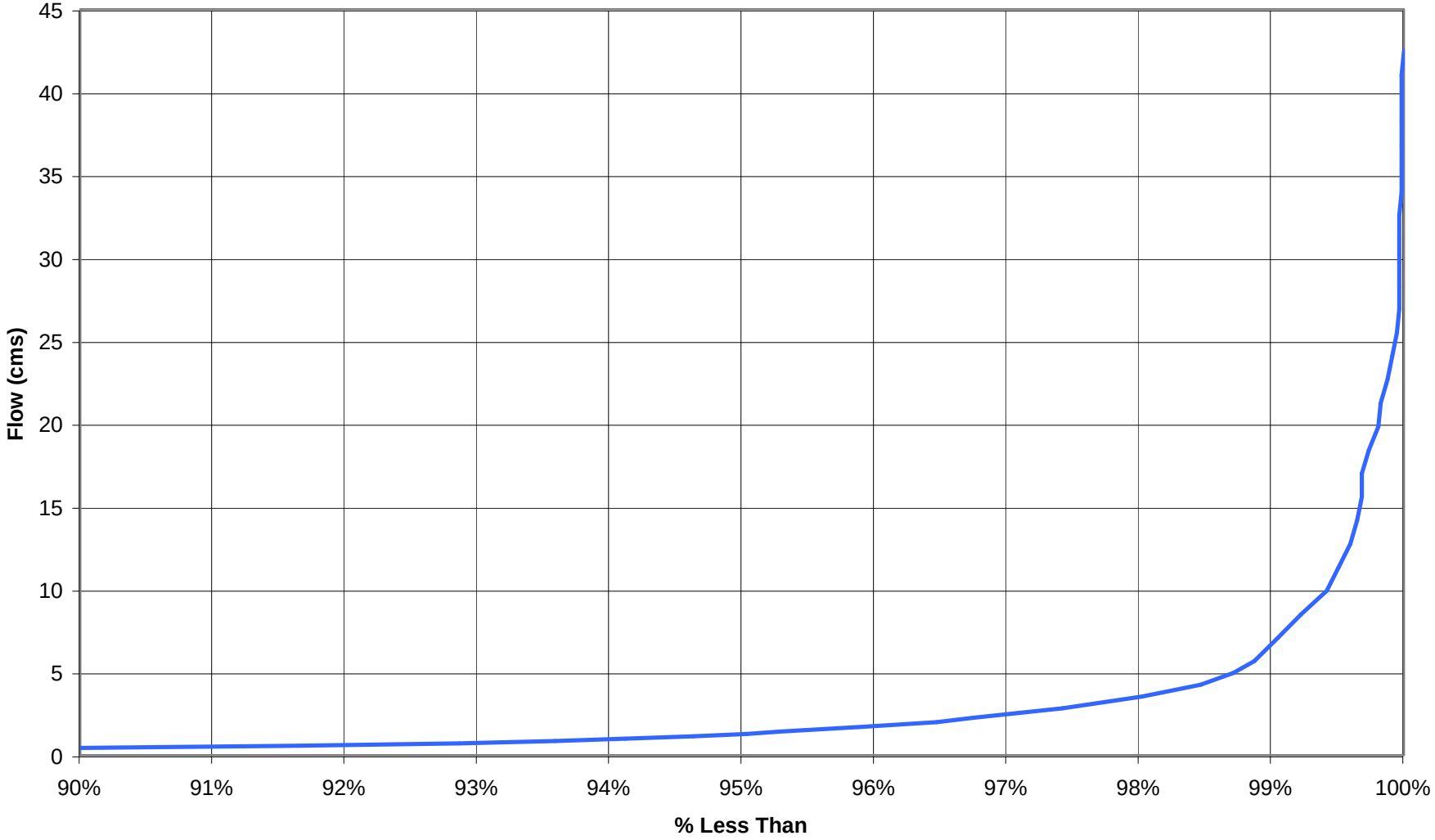
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 12 + 650 m - Downstream of Grande Pointe Diversion Drop Structure)



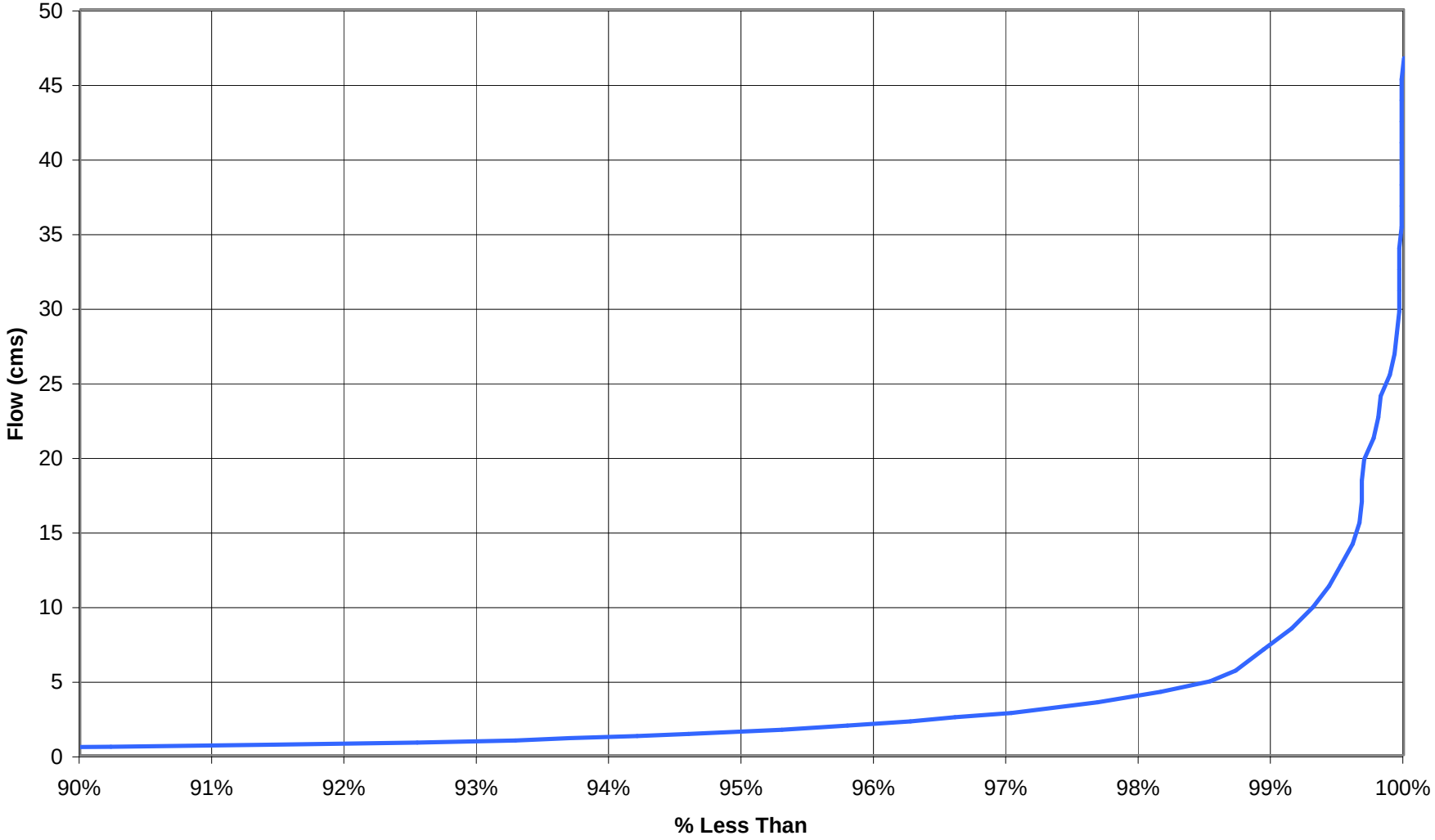
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 20 + 820 m - Downstream of Centreline/Prairie Grove Drain Drop Structure)



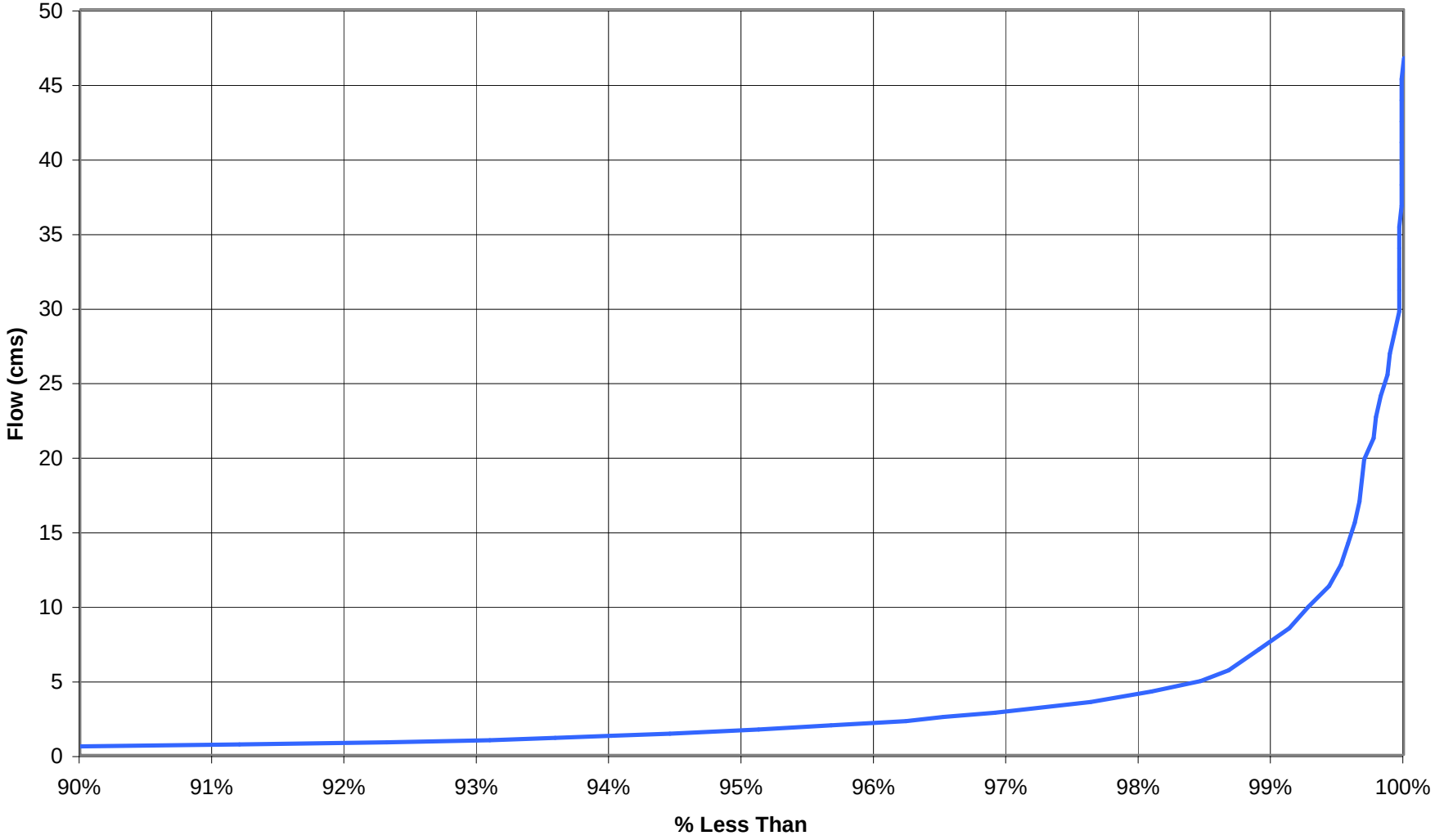
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 21 + 820 m - Downstream of Deacon Reservoir Drainage Drop Structure)



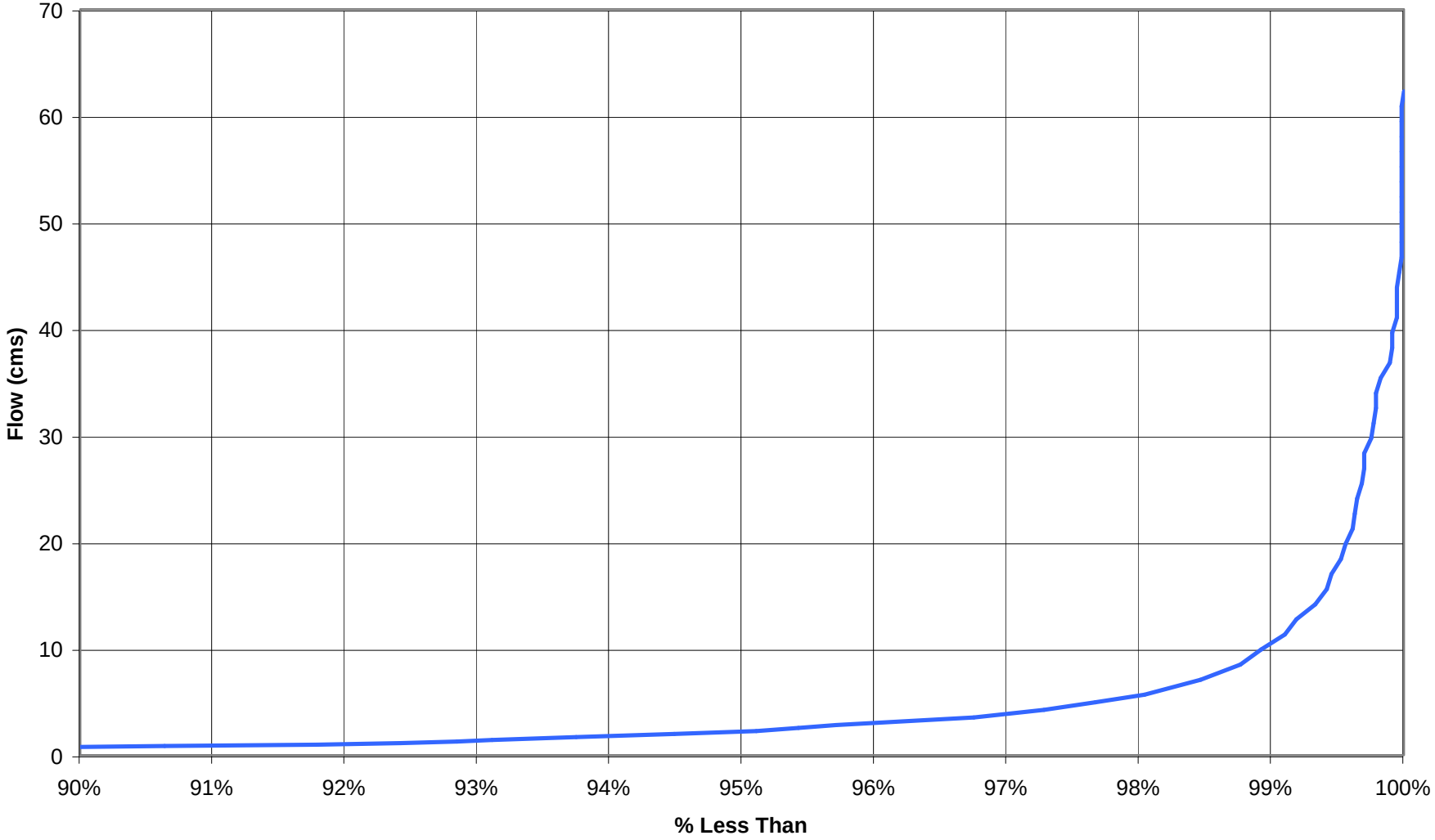
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 24 + 050 m - Downstream of North Bibeau Drain Drop Structure)



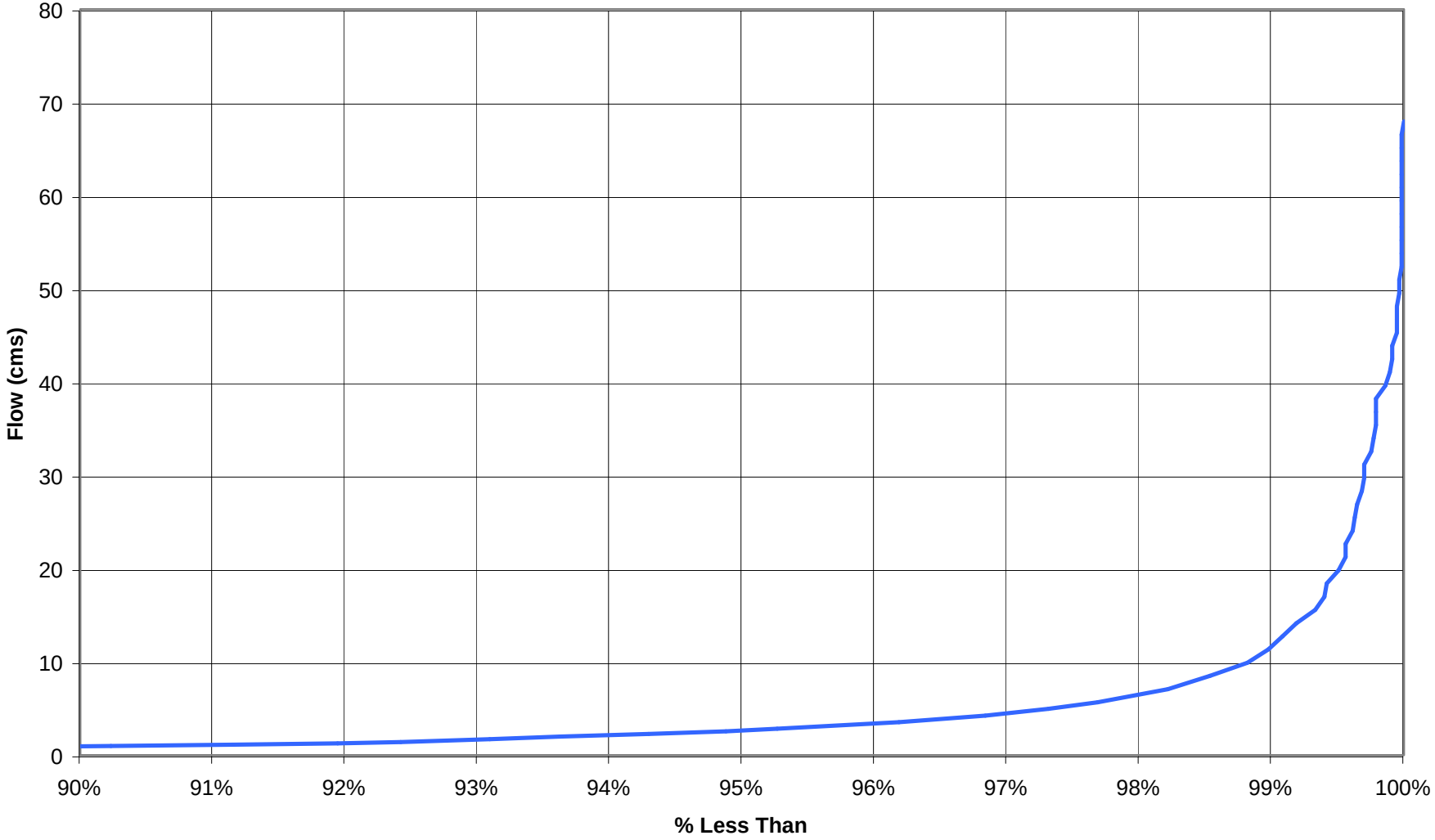
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 27 + 490 m - Downstream of Kildare Trunk - Transcona Storm Sewer Outlet Drop Structure)



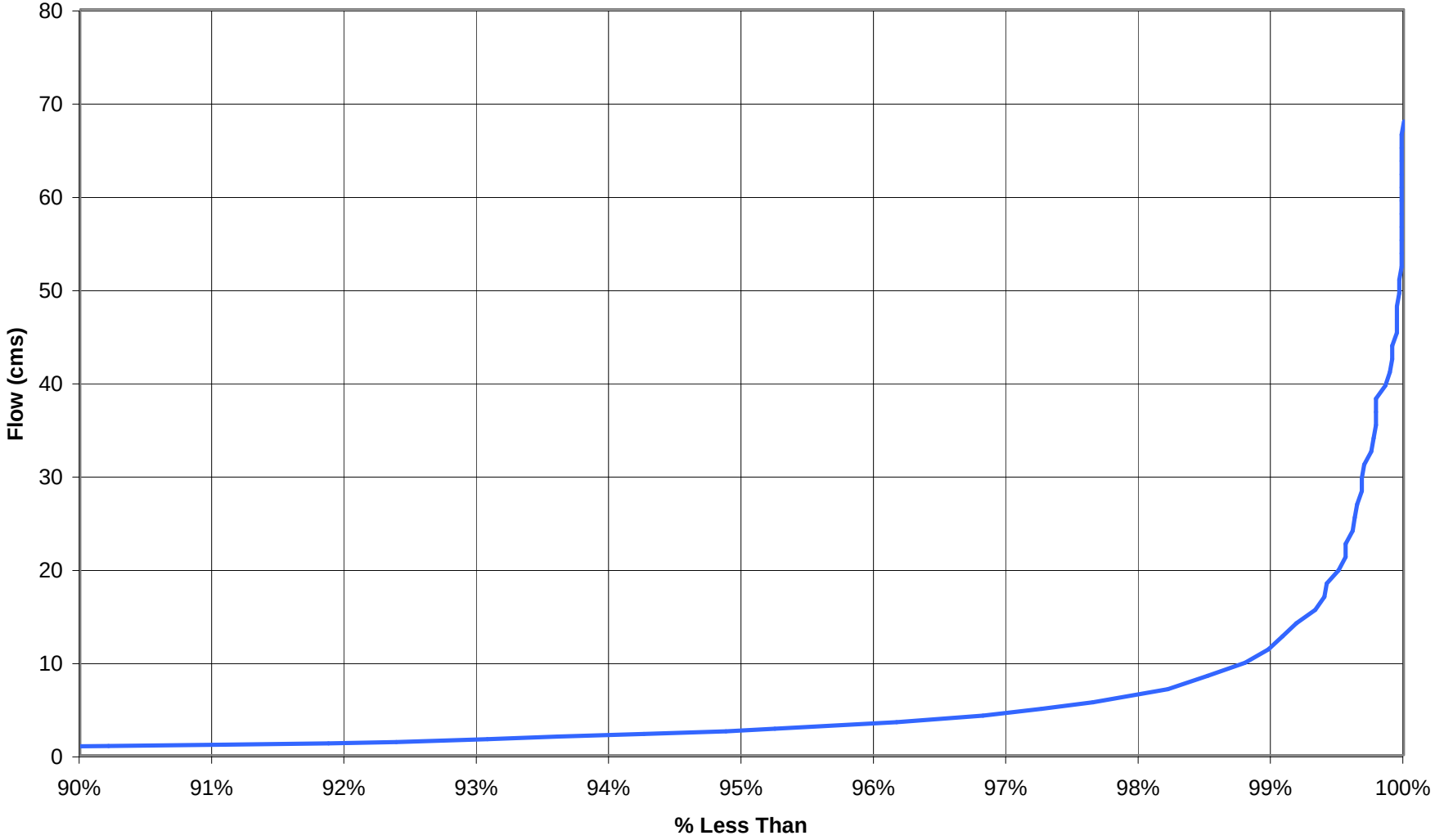
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 27 + 570 m - Downstream of Cooks Creek Diversion Drop Structure)



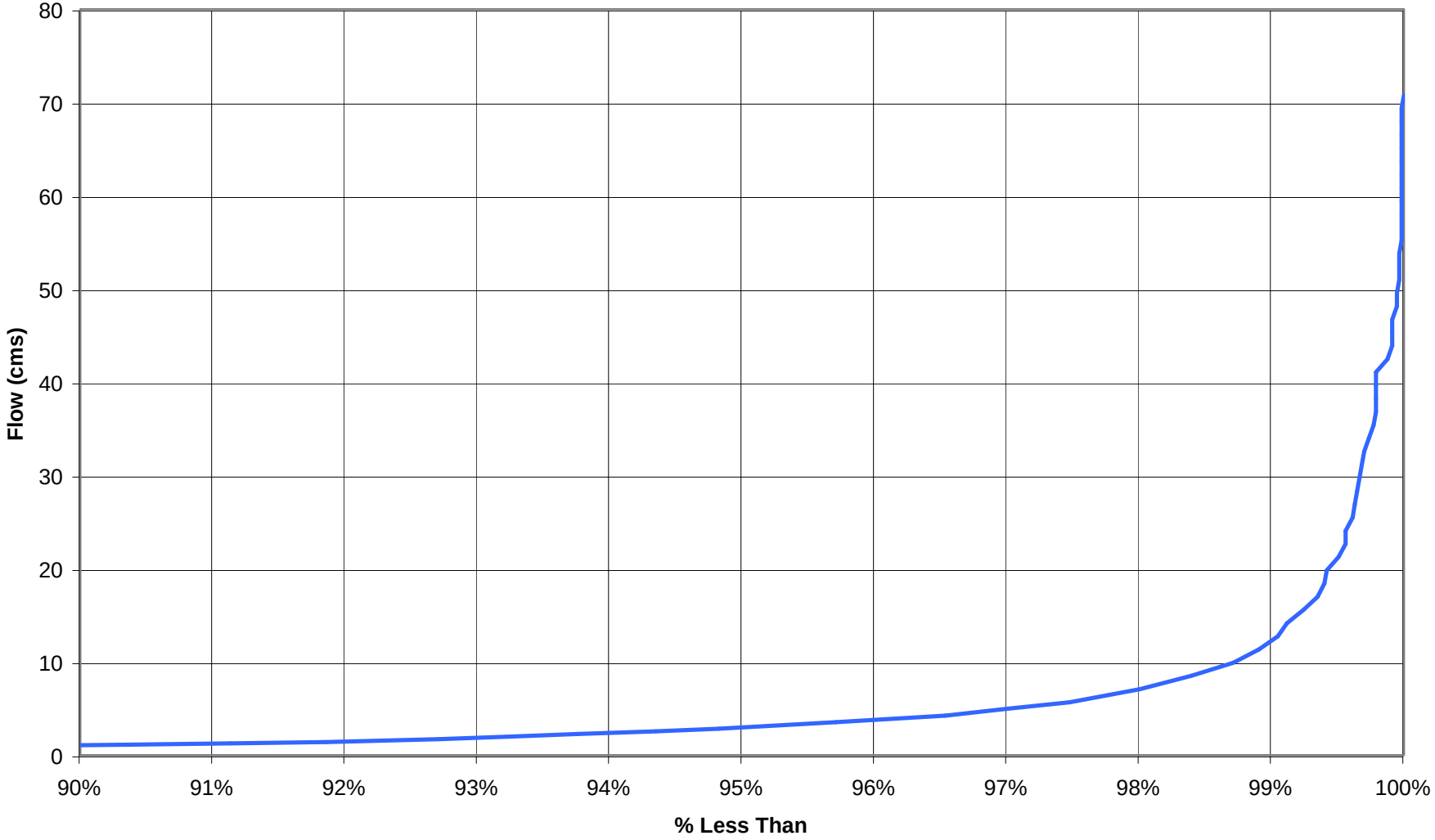
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 33 + 540 m - Downstream of Springfield Road Drain Drop Structure)



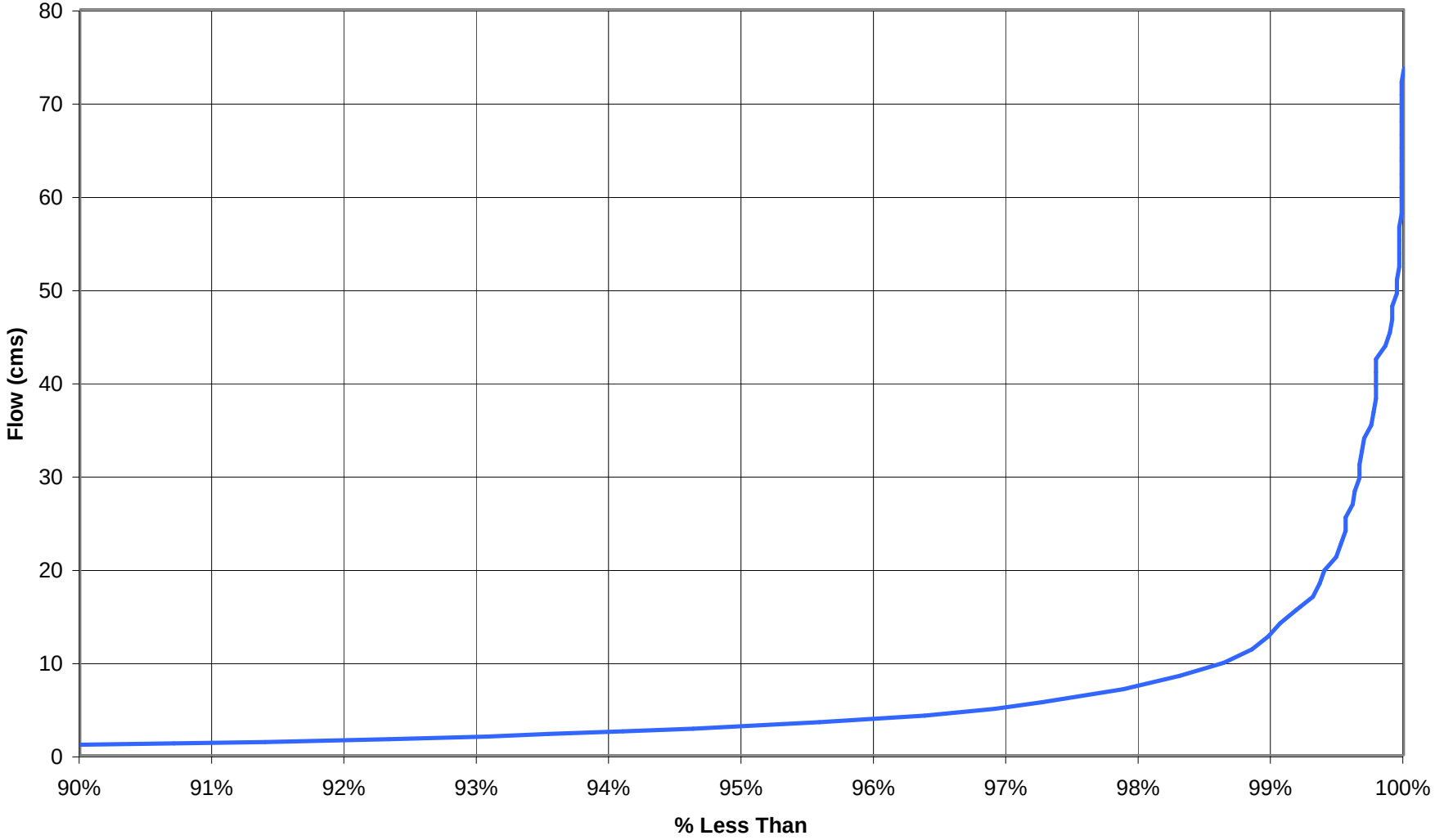
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 36 + 640 m - Downstream of Country Villa Estates Drain Drop Structure)



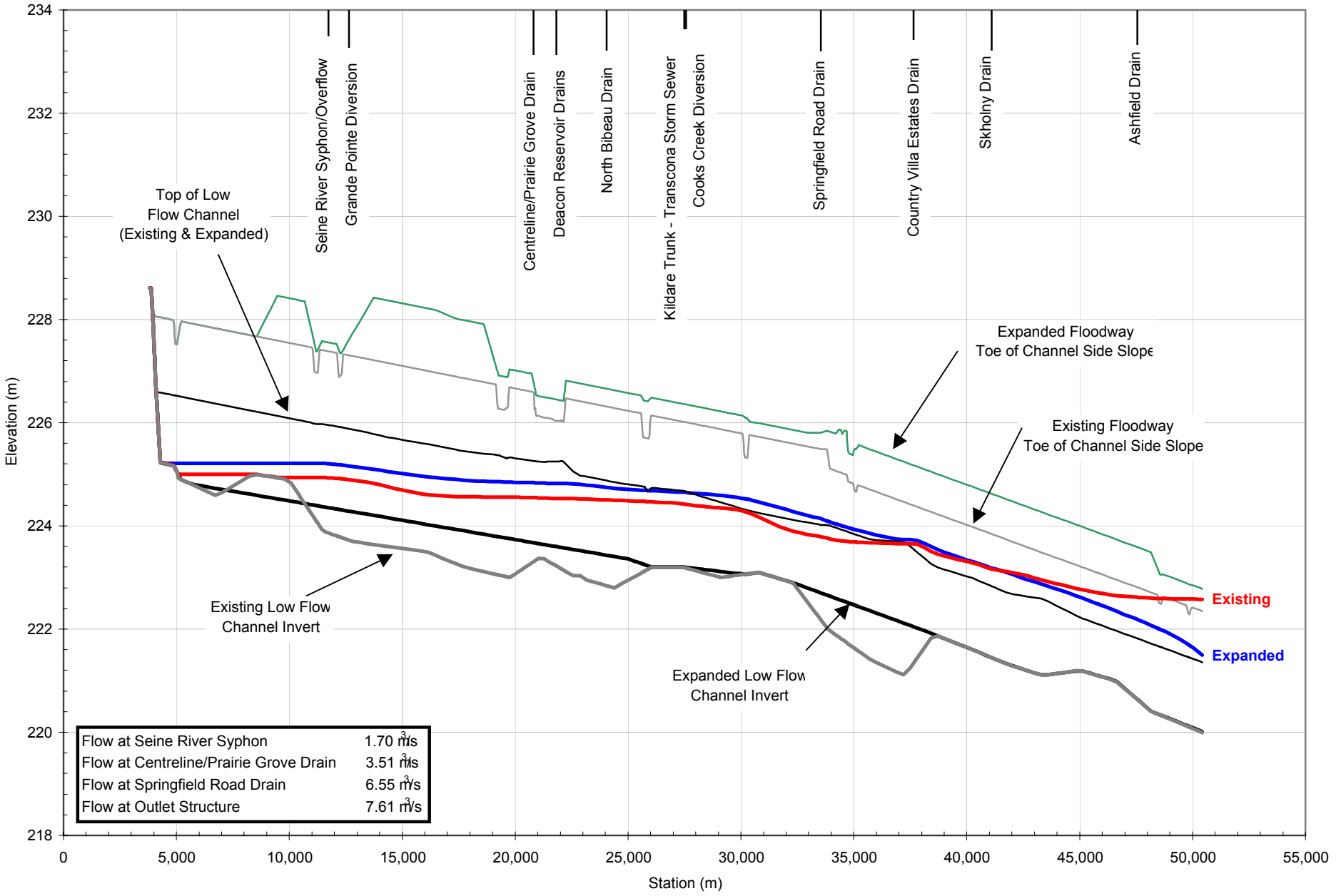
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 41 + 110 m - Downstream of Skholny Drain Drop Structure)



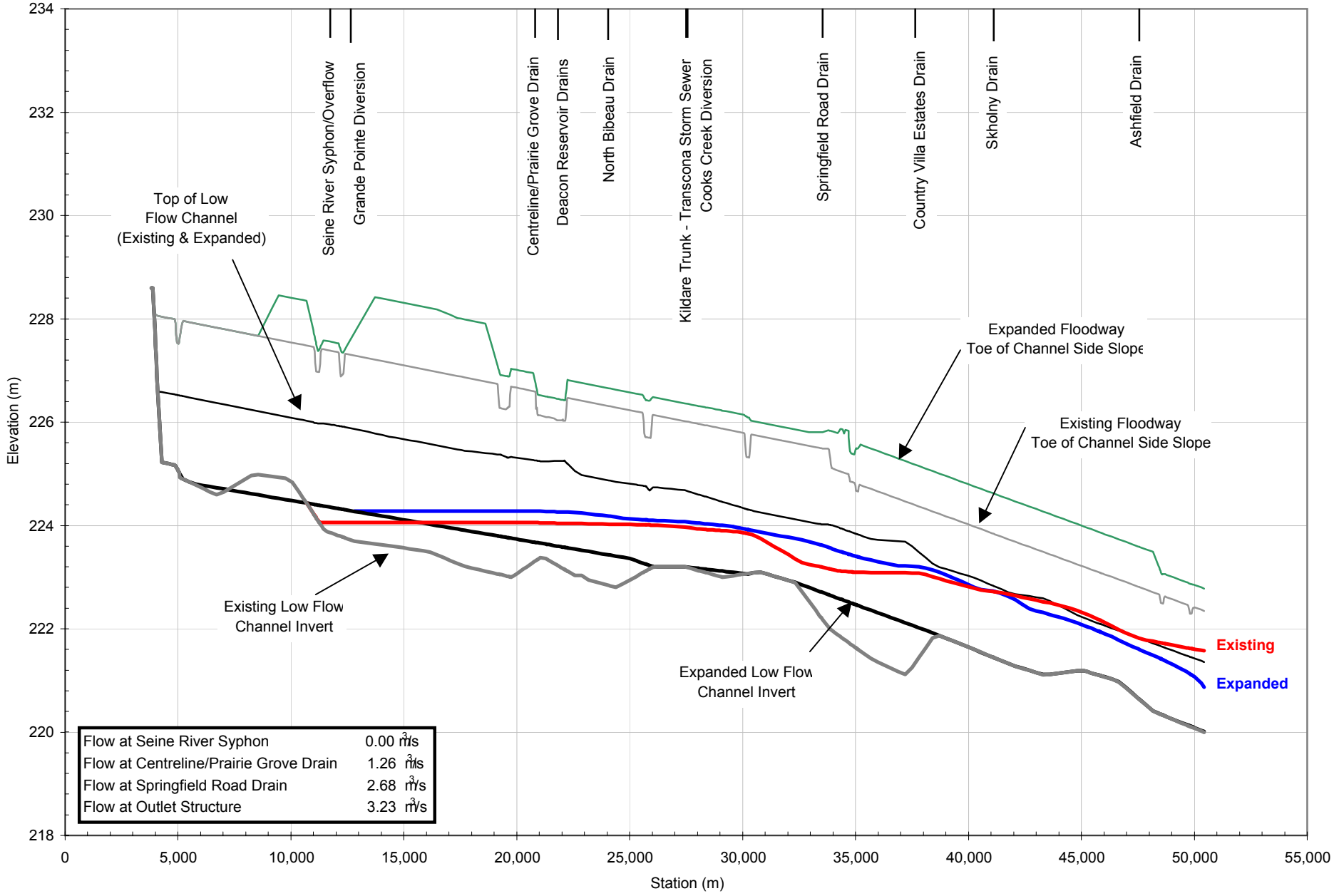
Duration Curve of Summer Flows in Floodway
June 1st to October 31st
(Station 47 + 560 m - Downstream of Ashfield Drain Drop Structure)

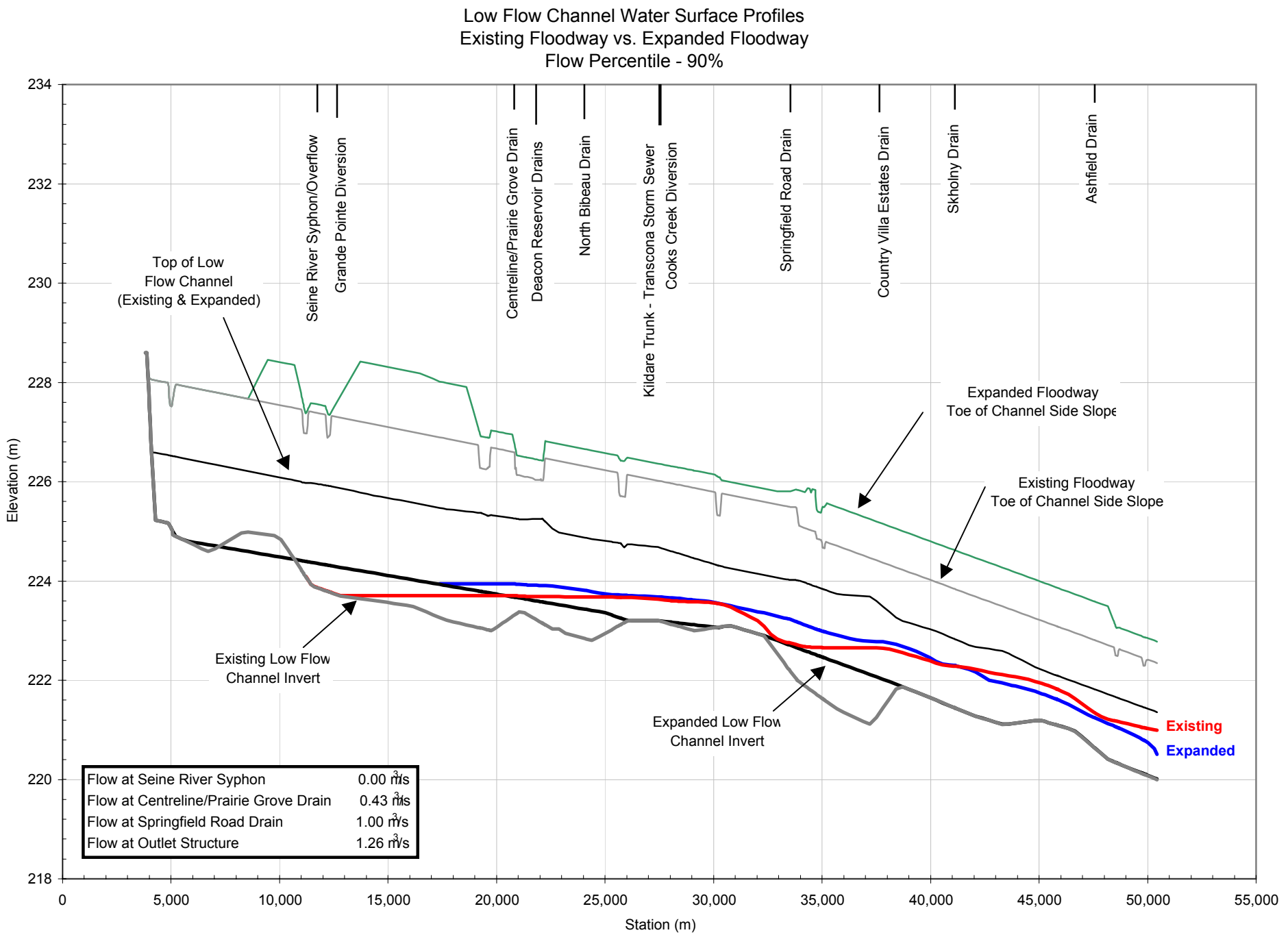


Low Flow Channel Water Surface Profiles
Existing Floodway vs. Expanded Floodway
Flow Percentile - 98%

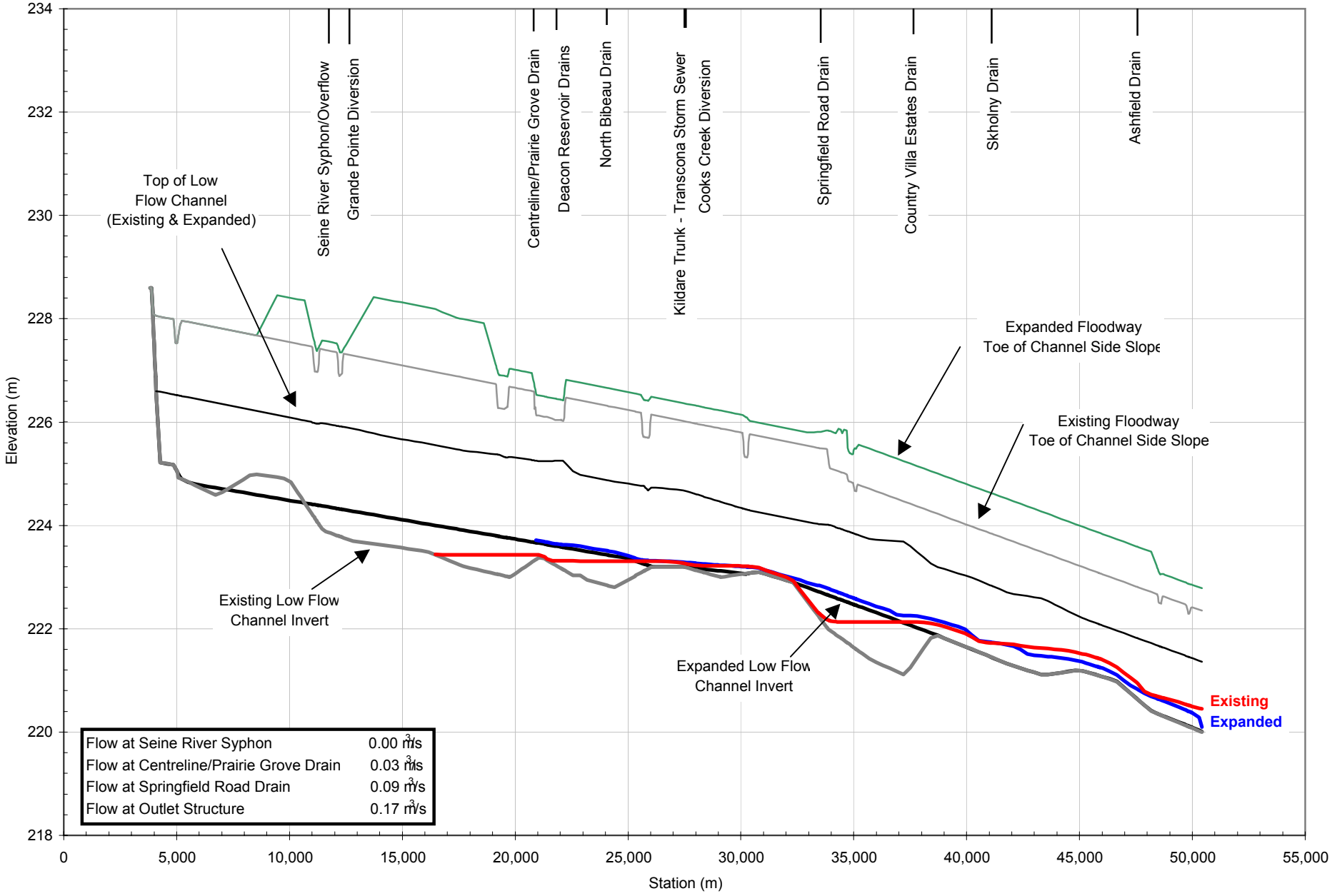


Low Flow Channel Water Surface Profiles
Existing Floodway vs. Expanded Floodway
Flow Percentile - 95%

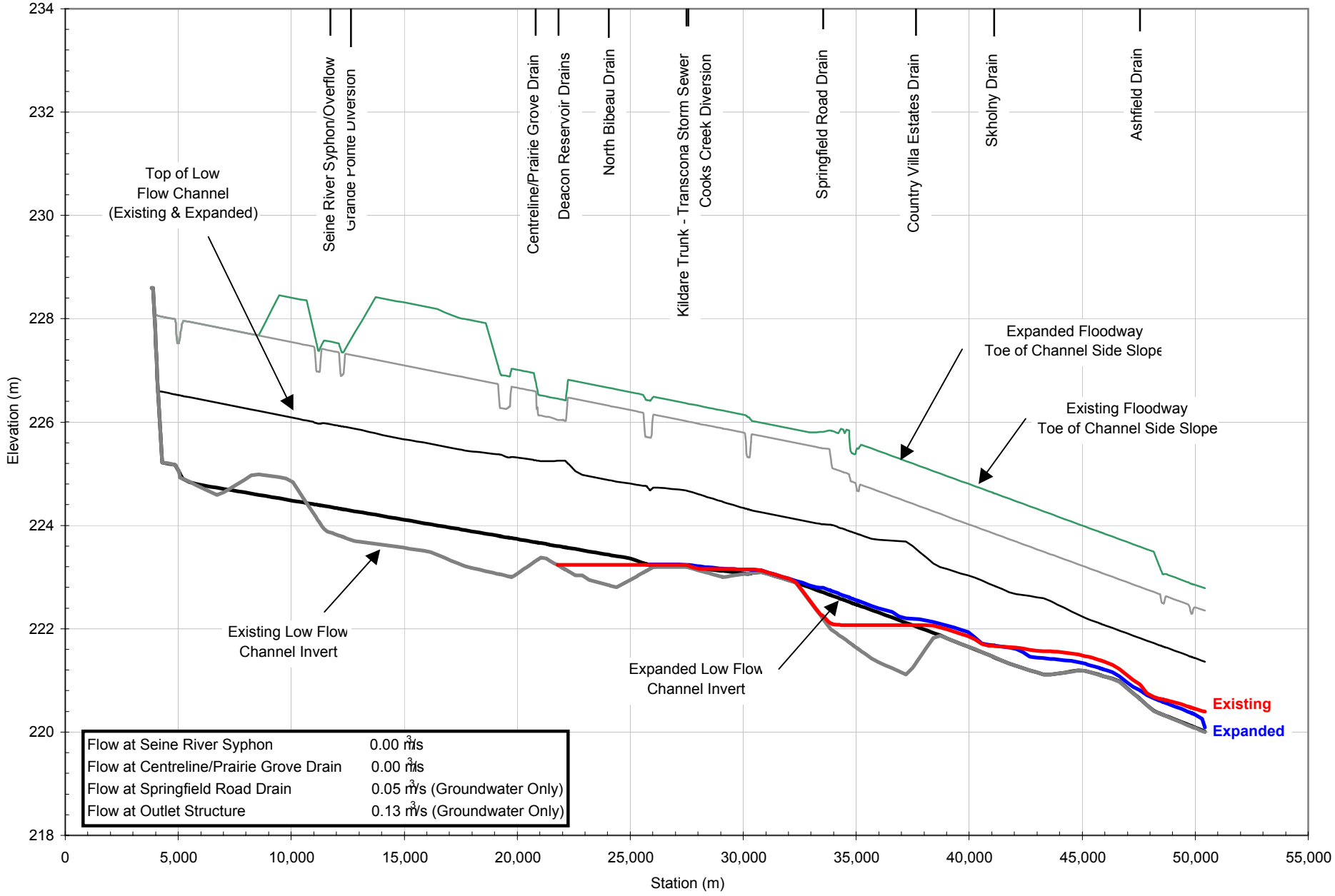



Low Flow Channel Water Surface Profiles
Existing Floodway vs. Expanded Floodway
Flow Percentile - 90%
Elevation (m)
Station (m)
234
232
230
228
226
224
222
220
218
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000
55,000
Seine River Syphon/Overflow
Grande Pointe Diversion
Centreline/Prairie Grove Drain
Deacon Reservoir Drains
North Bibeau Drain
Kildare Trunk - Transcona Storm Sewer
Cooks Creek Diversion
Springfield Road Drain
Country Villa Estates Drain
Skholny Drain
Ashfield Drain
Top of Low
Flow Channel
(Existing & Expanded)
Expanded Floodway
Toe of Channel Side Slope
Existing Floodway
Toe of Channel Side Slope
Existing Low Flow
Channel Invert
Expanded Low Flow
Channel Invert
Existing
Expanded
Flow at Seine River Syphon 0.00 m3/s
Flow at Centreline/Prairie Grove Drain 0.43 m3/s
Flow at Springfield Road Drain 1.00 m3/s
Flow at Outlet Structure 1.26 m3/s

Low Flow Channel Water Surface Profiles
Existing Floodway vs. Expanded Floodway
Flow Percentile - 50%



Low Flow Channel Water Surface Profiles
Existing Floodway vs. Expanded Floodway
Flow Percentile - 20%



REFERENCE: DFO Page 3

ITEM:

The proponent proposes to use glyphosate as part of the revegetation plan. This chemical is quite toxic to fish. Discuss the impacts of its use to fish and fish food sources (e.g., invertebrates, algae, aquatic plants, benthos).

RESPONSE:

Field trials over ground near wetlands indicate that even at the highest application rates (17.1 L/ha), concentrations of glyphosate in adjacent water were 100 – 10000 times less than concentrations known to be toxic to fish and aquatic life (LC_{50} for rainbow trout >7-12 mg/L; Chapman 1989; Solomon and Thompson 2003). In a B.C. study, 4.3 L/ha of Roundup was applied to terrestrial vegetation adjacent to a stream containing a 10m buffer zone. No change in the natural drift densities of a variety of benthic organisms was observed after the application of the herbicide (Kreisweizer and Kingsbury 1989; Reynolds *et al*. 1989). In comparison, the highest concentration of Roundup applied to vegetation within the Floodway ROW would be approximately 5.0 L/ha with a buffer zone of 50 – 80m.

Glyphosate, a herbicide used to control weeds, does not bioaccumulate, biomagnify or persist in a biologically available form in the environment (Solomon and Thompson 2003). Glyphosate is strongly adsorbed to soil, where it is broken down by soil microbes. The average half-life of glyphosate in soil is 60 days, yet may biodegrade at a faster rate in soils with high organic matter. Quick absorption to soil particles reduces the potential for this herbicide to leach into groundwater (USEPA 2004; Spectrum 2004; Monsanto 2004).

Generally glyphosate is not used to control weedy growth without an added surfactant, a chemical that helps glyphosate adhere to plant tissue (leaves). It is the surfactants that have the potential to cause toxicity in aquatic life (Solomon and Thompson 2003; Tsui and Chu 2003). Roundup (glyphosate + polyoxyethylene amine) is an example of a commonly used glyphosate containing herbicide. At high concentrations this herbicide has the ability to cause toxicity in aquatic life; however proper application of glyphosate mitigates the potential for even low concentrations to enter the low-flow channel.

A conservative approach in the amount of glyphosate applied to Floodway soils will minimize the potential for excess herbicide to enter into the low flow channel (Dickerson pers. Comm. 2004). The herbicide would be applied to soils on the upper spoil banks (200m from the low flow channel) using ground spray methods during dry weather (EIS Chapter 7, Section 7.3.1.2). In the event precipitation follows immediately after herbicide application, run-off of diluted glyphosate may enter a buffer of low-flow channel vegetation where it is further absorbed to plants and soil particles.

If surface runoff were to carry glyphosate-containing chemicals into the aquatic environment, glyphosates strong affinity for soil would cause it to bind to suspended sediment particles present in the low-flow channel and Red River. Sediment load for the Red River ranges from an average of 20 mg/L in fall and winter to 300 mg/L in spring (peaks can reach upwards to in excess of 500 mg/L; Chapter 5, Section 5.5). These sediments would either be degraded by microbial action in the surface waters (where glyphosate has a half-life of 7 to 14 days) or settle to the bottom where they would break down over time. Generally, through proper application, the concentration of herbicides entering the low-flow channel through surface run-off would be very diluted. Toxicology studies show that glyphosate levels that might occasionally be detected in surface waters following terrestrial application are sufficiently low so that there is negligible risk to aquatic organisms (Extoxnet 1994).

A hypothetical scenario of glyphosate loading from the Floodway to the Red River during minimum flows in one year is 2.9 µg/L, approximately 1000 times below the effective concentration of 3000 µg/L (concentration that would affect 10% of the most sensitive aquatic organisms tested by Solomon and Thompson 2003).

REFERENCES:

Chapman, P. M. 1989. Salmonid toxicity studies with Roundup. *In* Reynolds, P.E. *(ed.) Proceedings of the Carnation Creek Herbicide Workshop.* Sault Ste. Marie, Ontario, Canada: Forest Pest Management Institute. pg. 257.

Dickerson, J. 2004. Fingerlakes Conservation Services. New York. Personal communications between John Dickerson and Dave Hiebert from TetrES on November 5, 2004.

Extension Toxicology Network (Extoxnet) 1994. Pesticide Information Profile: Glyphosate. From http://pmep.cce.cornell.deu/profiles/extoxnet/dienochlor-glyphosate/glyphosate-ext.html on Nov 4, 2004.

Kreutzweiser, D.P and P.D Kingsbury. 1989. Drift of Aquatic Invertebrates in a Glyphosate Contaminated Watershed. *In* Reynolds, P.E. *(ed.) Proceedings of the Carnation Creek Herbicide Workshop.* Sault Ste. Marie, Ontario, Canada: Forest Pest Management Institute. pg. *250.*

Monsanto. 2004. Backgrounder: Glyphosate and Wildlife. Downloaded from www.monsanto_com/monsanto/layout/VSearchResults.asp?queryText=glyphosate on Nov 2, 2004.

Reynolds, P.E., Scrivener, J.C., Holtby, L.B. and P.D. Kingsbury. 1989. An Overview of Carnation Creek Herbicide Study: Historical Perspective, Experimental Protocols and Spray Operations. *In* Reynolds, P.E. *(ed.) Proceedings of the Carnation Creek Herbicide Workshop.* Sault Ste. Marie, Ontario, Canada: Forest Pest Management Institute. pg. 15.

Solomon, K.R. and D.G. Thompson. 2003. Ecological Risk Assessment for Aquatic Organisms from Over-Water Uses of Glyphosate. Journal of Toxicology and Environmental Health, Part B, 6:289-324.

Spectrum Laboratories Inc. 2004. Chemical Factsheet: Glyphosate. From www.speclab.com/compound/c1071836.htm.

Tsui, M.T. and L.M. Chu. 2003. Aquatic Toxicity of Glyphosate-Based Formulations: Comparison Between Different Organisms and the Effects of Environmental Factors. From www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=retrieve&db=pubmed&dopt=Abstract&list_uids=12821000 on November 4, 2004.

United States Environmental Protection Agency (USEPA). 2004. Groundwater and Drinking Water. From www.epa.gov/safewater/contaminants/dw_contamfs/glyphosa.html on April 6 2004.

REFERENCE: DFO Page 3

ITEM:

Discuss the potential for mercury mobilization into fish bearing waters during construction.

RESPONSE:

Mercury in uncontaminated soils of Western Canada has been estimated at approximately 7 to 40 ppb (Grigal, 2002). Mercury in these soils is associated with organic matter. Disturbance of agricultural soils reduces organic matter and causes a significant loss of mercury through volatilization and particulate loss. While volatilization will not impact fish-bearing waters directly, watershed inputs of mercury from particulates could be significant in the event of a summer storm event (Grigal, 2002). Some studies suggest that particulate loading during short periods of high flow could contribute 50-90% of annual Hg flux. Even though Hg content in the soil solution is generally low (less than 10 ppb), and yearly mean fluxes are also low (1.7 $\mu g/m^2/yr$ (Grigal, 2002), extant information suggests that every effort should be made to reduce erosion of floodway banks during construction.

Biological methylation of mercury is not expected in the upland soils and vegetation that will be disturbed by floodway construction, as methylation is normally associated with wetland conditions (Grigal, 2002). No significant effect is expected.

REFERENCE:

Grigal, D.F. 2002. Inputs and Outputs of Mercury from Terrestrial Watersheds: A Review. Environ. Rev. 10:1-39.

REFERENCE: DFO Page 3

ITEM:

In a project of this magnitude there is the potential for highly concentrated sediment plumes to enter fish bearing waters. These plumes are known to persist downstream for several kilometres due to density differences. Describe the impacts to fish and fish habitat of such an event.

RESPONSE:

In the Red River, concentrations of up to 600 mg/L TSS occur occasionally, and can last for weeks at a time (see Figure 5.5-1, EIS). The high sediment load is a normal function of the physical environment in which the River exists (see Section 5, EIS). These levels are much higher than would normally be found in productive fish bearing waters (Alabaster and Lloyd, 1982), which suggests that the fish found in the Red River are adapted to conditions of high sediment load.

Short-term sediment plumes high enough to produce acute lethality would likely have to be in the range of 100,000 mg/L (Alabaster and Lloyd, 1982). Lower concentrations for longer periods would have the same effect. This is not a likely scenario for the Floodway Expansion project (see Figure 5.5-3).

When exposed to sublethal concentrations of sediment, the epithelium of gills thicken and proliferate (Alabaster and Lloyd, 1982). There are also a host of fish physiological and behavioural responses to sublethal concentrations that have been discussed elsewhere. Refer to Appendix 6F-B (EIS) for more details.

Highly concentrated sediment plumes would not be expected to impact habitat in the Red River due to the normally high sediment load. Again, sediment loads due to project activity, with out any mitigation during low probability floods or rainfalls occurring during construction (Figure 5.5-3, EIS), are projected to be well within the normal range of sediment load. MFA is still committed to mitigation to reduce erosion during construction and minimize sediment discharged to the Red River. (Section 4 of the EIS).

REFERENCES:

Alabaster, J.S., Lloyd, R. 1982. Water Quality Criteria for Freshwater Fish. Butterworth Publishing Co., London.

REFERENCE: DFO Page 3

ITEM:

EPPs should include erosion and sediment control plans developed by a Certified Professional in Erosion and Sediment Control, and a monitoring and accountability program to ensure the certified erosion and sediment control plan is implemented. Include plans for monitoring potential sediment releases during construction into fish bearing waters and a description of remedial measures should increases in sediment levels become evident. DFO would like to review the EPPs when they become available.

RESPONSE:

Preliminary Erosion and Sediment Control Plan

The preliminary engineering phase of the Project included reviews of erosion and sediment control issues and presented conceptual measures for environmental protection.

West Dyke

Section 5 of *Preliminary Engineering Report: Appendix F West Dyke Surveys, Field Investigations and Pre-Design* presents a review of erosion protection measures to protect the West Dyke. The erosion concerns associated with the West Dyke are primarily associated with protecting the integrity of the dyke against wave action. Erosion and sediment control measures to protect watercourses that may be affected as a result of construction activities will generally follow those that will be developed in the detailed design phase and environmental protection plans.

Floodway Channel

Various sections of *Preliminary Engineering Report: Appendix B Floodway Channel Pre-Design* present the considerations given to erosion protection and sediment control associated with the floodway channel. Sections 3.0 and 7.0 consider the conditions of the existing channel, permissible maximum velocities and tactive forces, and the expected velocities and tactive forces for the preliminary design configurations. Section 9 of *Preliminary Engineering Report Appendix B Floodway Channel Pre-Design* presents the consideration in developing a conceptual channel re-vegetation plan for erosion control which is incorporated into the proposed sediment and erosion control plan described in Section 10. Section 10 of *Preliminary Engineering Report: Appendix B Floodway Channel Pre-Design*

outlines the erosion and sediment control concepts developed to date. These concepts will be further refined and finalize during the detailed project design and submitted along with the CPEP Plan. The introduction to Section 10 states:

> *"To mitigate potential negative environmental effects downstream from the construction site, it is necessary to identify the requirements for the control of erosion from rainfall runoff and potential sediment transport to downstream habitat in the Red River via the Floodway Outlet. An assessment of potential erosion of exposed excavation areas and their effects on the Red River is discussed in the following section. Recommendations for best management practices (BMPs) for construction timing and sequencing are outlined, and accepted sediment and erosion control techniques to mitigate environmental effects are presented."*

Section 10 proposed BMPs for erosion protections as follows:

- The following best management practices (BMP) will be considered as components of the sediment and erosion control plan to minimize the potential for erosion.
- Construction timing and sequencing will be coordinated to maximize excavation while minimizing the time of exposure for newly excavated slopes to less than 30 days before planting.
- Minimize disturbance to adjacent vegetated areas and base of Floodway for buffering suspended sediment.
- Implement "Surface Roughening" techniques.
- Re-vegetate exposed areas directly after finished grade is established and minimize the amount of over-winter exposed surfaces.

Each BMP approach is discussed in detail.

The following recommendation for erosion and sediment control during construction of the floodway channel are presented:

As a minimum, the following measures are recommended to mitigate erosion and the transport of sediment within the channel work areas:

- Excavation of the channel in discrete lengths and from the top of slope downwards.
- Maintenance of vegetation buffer where possible (assumed negligible cost to overall construction).
- Slope roughening techniques.
- Perimeter and intermediate (along the disposal embankment and Floodway benches) silt fences.
- Flow interceptor swales at regular intervals (25 to 30 m) cross-slope (parallel to contours).
- Temporary seeding.

Bridges And Drop Structures

Limited excavation will take place at the bridges and drop structures but there will be activities that impact the existing vegetation cover and expose soils. For example bridge pier demolition and reconstruction will be required. Again BMPs including silt fences and erosion resistant pads are discussed for the construction period and rip rap and re-vegetation are discussed for the post-construction period.

Section goes on to state “there are many alternatives for the control of erosion and sediment transport during construction. As such, the final design of the controls will be prepared as part of the overall Environmental Protection Plan (EPP) specifications.”

A framework for the Construction Phase Environmental Protection (CPEP) plan is provided as Section 12 Construction Phase Environmental Protection (CPEP) Plan. The CPEP Plan will be developed following detailed engineering design by the Manitoba Floodway Authority, engineering consultants, and the construction contractors and submitted for approval prior to start of construction.

The framework calls for:

- The Erosion and Sediment Control Plan to be developed by qualified professionals.
- The Plan to follow the guidance document date November 21, 2003, prepared by Manitoba Conservation
- Monitoring and reporting of erosion and the effectiveness of erosion and sediment control.

- Monitoring and reporting of nutrient and herbicide application.
- Documentation on the monitoring and reporting is to be retained on site.
- The CPEP Plan is also to be audited by a trained and experienced auditor.

Erosion protection is discussed elsewhere in the reports respecting the Inlet structure, Outlet structure and west bank of the Red River near the Outlet. These are primarily discussed in terms of protecting against effects of erosion on those areas rather than the effects of erosion as a vehicle of sediment transport and resultant ecological impacts.

REFERENCE: DFO Page 3

ITEM:

Describe the effects on fish and fish habitat of increasing agricultural drainage capacity as proposed in the Project.

RESPONSE:

The outlet to the floodway may be increase in some locations so as to not create a "bottleneck" for future drainage projects. Increased drainage is not part the Project. Therefore no fish or fish habitat effects are anticipated due to increased drainage. Any changes to habitat due to changes in configuration of the drainage outlets to the floodway will be further assessed as part of the Fish Habitat Compensation Plan.

This issue is discussed further in response to TAC/MFA-S-34.

REFERENCE: DFO Page 3

ITEM:

Discuss the effects of hardening the river banks and bottom as proposed in the Project on such factors as river morphology, invertebrates, riparian vegetation, etc.

RESPONSE:

Please refer to the response to DFO/MFA-S-15 for a discussion of the above issue.

REFERENCE: DFO Page 3

ITEM:

Describe more comprehensively the potential impacts of the Project on fish and clam habitat.

RESPONSE:

Refer to DFO/MFA-S-15 and DFO/MFA-S-9 responses.

REFERENCE: **DFO Page 4**

ITEM:

Describe the potential impacts of the Project on fish movements and migration patterns. Address the implications for domestic and international fish stocks.

RESPONSE:

Refer to DFO/MFA-S-16 and DFO/MFA-S-17 responses.

REFERENCE: DFO Page 4

ITEM:

Describe the potential impacts of the Project on clam dispersal mechanisms.

RESPONSE:

Refer to DFO/MFA-S-18.

REFERENCE: DFO Page 4

ITEM:

Describe the potential fish mortality associated with each project component, including the inlet control structure, outlet structure, low flow channel, Seine River syphon, drop structures and drains.

RESPONSE:

See response to TAC/MFA-S-33.

REFERENCE: DFO Page 4

ITEM:

Describe the potential impacts of the Project on fish and clam populations.

RESPONSE:

EIS Section 6.0 provided an assessment with respect to the potential effects and residual impacts of the Project on fish and clams based on available existing information regarding these species (as summarized in Appendix 6) and the various aspects of the Project's construction and operational regimes (i.e., active and inactive operations). An evaluation of the potential significance of impacts of the Project on fish and clam populations is provided, within the fundamental limitations outlined in Appendix 6D (West Dyke, Floodway Channel and Red River near Outlet), and Appendix 6E (existing aquatic environment) regarding the ability to define fish and clam populations. Appendix 6E provides an evaluation of aquatic surveys, which demonstrates the high degree of variability in the local aquatic communities and the inherit difficulty in defining fish and clam populations in the area.

REFERENCE: DFO Page 4

ITEM:

Describe potential impacts of the Project on Aquatic Species at Risk.

RESPONSE:

As indicated in the EIS, Section 6.7:

> *"No Federal or Provincial species listed as Endangered or Threatened (i.e., populations and habitat that are protected) are anticipated to occur in the area affected by the Project. Four fish species of special concern (as listed by **SARA**) may occur in the Red River, but are not anticipated to be affected by the Project. Therefore, no effects to the listed aquatic biota in the affected Ecodistricts are anticipated."*

Please refer to DFO-MFA-S-20 for additional information.

REFERENCE: DFO Page 4

ITEM:

Consider Lake Sturgeon in assessment as it is likely to be designated SARA.

RESPONSE:

Refer to DFO/MFA-S-21 response.

REFERENCE: DFO Page 4

ITEM:

In keeping with DFO's *Policy for the Management of Fish Habitat*, an Authorization under Section 35(2) of the *Fisheries Act* will not be issued until acceptable measures to compensate for the habitat loss are developed and specific terms and conditions for the development of new habitat or enhancement of existing habitat are agreed upon. Please provide a plan for the achievement of no net loss of fish habitat following DFO's hierarchy of preferred compensation options as detailed in DFO's *Habitat Conservation and Protection Guidelines*. Include a description of the monitoring program used to determine if the compensatory habitat is functioning as intended and corrective measures should this not be the case.

Describe how unpredicted effects on fish and fish habitat will be identified and addressed.

RESPONSE:

Once defined by the final Project design, the projected effects on fish habitat will be summarized and acceptable measures incorporated to remain "*consistent with the concept of sustainable development*" and compliant with the "*Policy for the Management of Fish Habitat"* and the associated *"Habitat Conservation and Protection Guidelines"* principles, of which Section 2.1 notes that *"the purpose of these Guidelines is to assist DFO staff in applying the Policy for the Management of Fish Habitat to projects that could affect fish habitat productive capacity in a fair, consistent and predictable manner across Canada.*"

It is anticipated that both Provincial fisheries Branch and DFO agreement (as per the *Policy for the Management of Fish Habitat)* on whether the proposed measures are acceptable will be necessary to ensure that the Project remains in compliance with the *Fisheries Act*. These details will be further explored in Fish Habitat Compensation Plan, which will be based on the Project's final design. The supplemental documentation will include additional information including plans to achieve no net loss of habitat, monitoring programs to confirm compensatory habitat is functioning as intended, potential corrective measures it is not, and how other unpredicted effects on fish habitat will be identified and potentially addressed.

In order to address effects which may be difficult to predict, such as future changes to operation, an adaptive management approach as described in Supplementary Filing Section 8.0 regarding Floodway Operation (specifically Section 8.2.) This approach will both identify effects and will propose and test mitigation.