Water Security Agency

Developing a New Reservoir Operating Plan For Lake Diefenbaker:

Questionnaire Summary

November 2012

Executive Summary

Responses to this questionnaire are from a wide variety of users who have a number of interests in the management of Lake Diefenbaker. Of the 31 questionnaire respondents, 35% relied upon or valued the system primarily for recreational services, 13% primarily for irrigational services, 6% primarily for environmental services, 3% primarily for flood control services, 3% primarily for municipal/domestic water supply services, 3% primarily for ferries/riverboat services, 3% primarily for industrial services, 3% primarily for electrical production services, and 29% indicated that their organization/community/First Nation relies upon more than one of Lake Diefenbaker services.

The majority of the respondents thought all of the services that the reservoir provides are important to extremely important in the decision making associated with the management of the South Saskatchewan River Project (Question 1).

It is obvious throughout the responses that users believe that no one management response will work in all situations. The renewed Lake Diefenbaker reservoir operating plan will need to be dynamic and flexible to accommodate the various flow/water level situations that arise.

When looking at the ten trade-offs between services provided by the reservoir, as outlined in Question #2, six trade-off situations had equal votes for each of the two services. However, there were responses that indicated respondents had preferences to one service over another, these comparisons included: 1) a preference to flood control over hydroelectric power generation; 2) a preference to fish and aquatic habitat over hydroelectric power generation; 3) a preference to flood control over recreation downstream of the reservoir; and 4) a preference to flood control over recreation on the reservoir. Looking at the responses in terms of preferences and rankings against each other, they fall out as follows (highest to lowest preferences): Flood Control, Drought Resilience, Fish and Aquatic Habitat, Irrigation, Hydroelectric Generation and Recreation.

The majority of the respondents (78%) thought all of the criteria (safety, ecosystem health, seasonal timing, flow level of year, rate of flow, loss of opportunity for other services, quantity of flow, economics, shoreline erosion) with the exception of daily timing, were important to extremely important when assessing whether water should be released for particular activities (Question #3).

Respondents were asked to rate the importance of Lake Diefenbaker water levels, timing of flows or water levels, and downstream flow as factors to their organization/community/First Nation for making water management decisions (Question #5). Seventy percent of respondents indicated that Lake Diefenbaker water levels were a very important to extremely important factor to their organization/community/First Nation for making water management decisions. Sixty percent of respondents indicated that timing of flows or water levels was a very to extremely important factor for making water management decisions. Downstream flow was considered to be a very important to extremely important factor to 36% of respondents.

Respondents provided feedback on their ideal minimum/maximum lake levels as well as their tolerance to fluctuations in water levels (Questions #7). Eleven of the 20 respondents to Question

7 provided feedback on their ideal minimum lake levels (Table 8). Of the eleven responses, seven (64%) suggested a minimum water level ranging between approximately 550.00 metres above sea level (masl) to 552.87 masl. The remaining four respondents did not provide actual minimum water levels but rather stated that they wanted other reservoir services to be considered when evaluating the minimum water level, these services included: fish spawning habitat; a level that does not restrict drinking water and reservoir water supply; a level that does not disrupt quantity/quality of source water; and a minimum level that is "acceptable" to natural aquatic populations. Fourteen respondents to Question 7 provided feedback on their ideal maximum lake levels (Table 9). Of the 14 responses, six (43%) suggested reducing the full supply level by 1 to 3 metres; two thought the current full supply level is okay; one suggested operating at the highest safe water level elevation; two wanted the reservoir full in the summer; the remaining three respondents indicated that there needs to be consideration of the services the reservoir provides when determining maximum lake levels, including Piping Plover nesting habitat; natural aquatic populations; and quantity/quality of source water. Of the eight respondents who discussed the fluctuations in Lake Diefenbaker's water levels, six indicated that they would like to see a reduction in water level fluctuations, one respondent is fine with Lake Diefenbaker's variable water levels, and one respondent feels it is important for the water levels to fluctuate to provide for a variety of aquatic habitats

The majority of respondents indicated that the critical time frame for their organization/community/First Nation's use of Lake Diefenbaker/South Saskatchewan River was between early spring and late summer (Question #8).

When asked what rate of water level changes cause problems with your use of Lake Diefenbaker/South Saskatchewan River the majority of respondents replied the extremes (low water levels/flows and high water levels/flows and sudden changes in water levels (Questions #9 and #14).

Seventeen respondents provided feedback on their ideal minimum/maximum flows, as well as their tolerance to fluctuations in flows, of the South Saskatchewan River downstream of Gardiner Dam (Questions #12). Six (35%) of the respondents indicated that either the question was not applicable or that they are not affected by the flows of the South Saskatchewan River downstream of Gardiner Dam. Six of the 17 respondents to Question 12 provided feedback on their ideal minimum flows of the South Saskatchewan downstream of Gardiner Dam (Table 15). Of the six responses, three (50%) suggested a minimum flow between 62.3 m^3/s and 200 m^3/s. The remaining three respondents did not provide actual minimum flow values but rather stated that they wanted other services to be considered when evaluating the minimum flows, these services included: flows should closely reflect the natural and historic flow regimes of the South Saskatchewan River (drought/flood cycles); Flows that do not disrupt the quantity/quality of source water; and Minimum flows that can be "accommodated" by reservoir uses. Eight respondents to Question 12 provided feedback on their ideal maximum flows (Table 16). Four of the eight respondents provided an ideal maximum flow ranging from 360 m^3/s to 1800 m^3/s. The remaining four respondents did not provide an actual maximum ideal flow but rather stated that they wanted other services to be considered when evaluating the maximum flows, these services included: flows should closely reflect the natural and historic flow regimes of the South Saskatchewan River (drought/flood cycles); flows should not exceed a level that causes flooding;

flows that do not disrupt the quantity/quality of source water; and maximum flows that can be "accommodated" by reservoir uses. Both respondents who discussed the fluctuations in flows of the South Saskatchewan downstream of Gardiner dam indicated that they would like to see more consistent flows.

The majority (67%) of the respondents felt that on a seasonal/annual basis their water level or flow needs were met most of the time (Questions 15 and 16).

Nineteen (61%) of the 31 questionnaire respondents answered the question: within the past five years, how often were your water level or flow needs met? (Question 17). Seven (37%) of the respondents indicated that their water level or flow needs have been met most of the time. Six (32%) of the respondents felt that their water level or flow needs were met more than 50%, but less than 75% of the time. Two (11%) of the respondents felt that their water level or flow needs have not been met in the past five years. The remaining three (16%) of the respondents felt that they did not have enough information to answer this question or that the question was not applicable to their use of Lake Diefenbaker or the South Saskatchewan River (Table 22).

Nineteen (61%) of the 31 respondents answered the question: do you think the available water storage in Lake Diefenbaker should be decreased, stay the same or increased for flood control (or if you prefer should we provide 1 in 100, 1 in 500 protection)? (Question 18). Five (26%) of the respondents felt that the available water storage should be decreased. Three of the five respondents that indicated that they wanted a decrease in water storage only wanted a slight decrease in storage, the remaining two respondents wanted a 1 metre and 1.5 metre decrease in Full Supply Level. Six (32%) of respondents felt that the available water storage should remain the same. Two (11%) of respondents indicated that they would like water storage in Lake Diefenbaker to increase. Five (26%) of respondents indicated that they would like water storage in Lake Diefenbaker to remain flexible (Table 23).

The majority of respondents understood that there will likely be circumstances where the Water Security Agency will be asked to and may deviate from the normal operating plan under special requests (Question 19).

The majority (74%) of respondents feel that it is important to extremely important to manage the reservoir to ensure a reserve supply to meet water needs during times of drought (Question 20).

In terms of general comments, ten (32%) of the 31 respondents provided general feedback/comments. Two (20%) suggested the need for improved flow and water level forecasting in the management of Lake Diefenbaker. Two (20%) of the ten respondents would like to ensure that the future growth for both tourism/recreation and economic development is considered in the renewal of the Lake Diefenbaker reservoir operating plan. One (10%) of the respondents indicated that it is important that flexibility is built into the operating plan. Another respondent recognized that the management of Lake Diefenbaker is multifaceted and has many different interests to try to accommodate. One respondent suggested the formation of a Lake Diefenbaker Reservoir Board or a water council that would likely include stakeholders from a diversity of interests

The feedback gathered through the questionnaire, the response sessions, and the consultation/engagement process, along with technical and financial considerations will be used to inform the development of a new Lake Diefenbaker Reservoir Operating Plan resulting in more formal rules and operating procedures for Gardiner dam.

Introduction

This report summarizes the questionnaire responses received from 31 stakeholders about their issues, concerns and priorities associated with the management of Lake Diefenbaker. The questionnaire was one of the stakeholder feedback methods used by the Water Security Agency (previously Saskatchewan Watershed Authority) to seek advice from targeted local, regional, provincial, and federal stakeholders about the management of Lake Diefenbaker.

The results contained in this document and its appendices are the responses received from the 31 respondents to the questionnaire. The questionnaire, which consisted of twenty questions, is located in Appendix 1. The first five questions were multiple-choice, with the remaining fifteen questions being open-ended questions. The verbatim responses to the open-ended questions are located in Appendix 2.

Printed copies of the questionnaire were distributed to the stakeholders at the initial Targeted Stakeholder Consultation/Engagement meeting on May 30, 2012; and at the various response sessions that were held in July, September and October. At each of the response sessions stakeholders were reminded to complete the questionnaires and to send the completed questionnaires to the Water Security Agency for compilation.

Feedback gathered through the consultation/engagement process, from the questionnaire and the response sessions, along with technical and financial considerations will be used to inform the development of a new Lake Diefenbaker Reservoir Operating Plan resulting in more formal rules and operating procedures for Gardiner dam.

Questionnaire Response Rate

It was determined that 26 percent of the people that received a survey completed and returned it to the Water Security Agency by the October 31st deadline. Altogether, 121 stakeholders participated in either the initial stakeholder meeting on May 30th and/or one of the response sessions held between July to October 2012. By October 31, 2012, the deadline to complete the questionnaire, the Water Security Agency had received 31 completed questionnaires.

Question 1:
As a stakeholder how do you think the Saskatchewan Watershed Authority should prioritize each of the following factors in the management of the South Saskatchewan River Project (please rate them according to your organization/community/First Nation's priority).

All 31 respondents answered at least one component of Question 1. The majority of the respondents thought all of the services that the reservoir provides are important to extremely important in the decision making associated with the management of the South Saskatchewan River Project. On average, eighty-four percent of all responses were rated as important to extremely important for the first 12 factors of Question 1 (Table 1).

In decreasing order, the percentage of respondents felt that the following reservoir services were important to extremely important factors to consider when making management decisions associated with the South Saskatchewan River Project: Maximum net environmental benefits to Saskatchewan (94%); Water supply (municipal/urban distribution) (90%); Maximum net economic benefits to Saskatchewan (90%); Fish and aquatic habitat (87%); Water quality (87%); Flood control (81%); Hydroelectric production (77%); Slope stability and shoreline erosion (77%); Wildlife and terrestrial habitat (77%); Recreation on the reservoir (71%); Irrigation (68%); and Recreation downstream of the reservoir (65%) (Table 1).

Thirteen respondents answered Other? (e.g., agricultural uses not related to irrigation) for Question 1. Of the respondents that answered this component of Question 1, 62% felt that agricultural uses not related to irrigation are important to extremely important factors that need to be considered in management decisions associated with the South Saskatchewan River Project (Table 2). Of the thirteen responses, only the two respondents that responded that it was very important, to consider agricultural uses not related to irrigation as a factor in the management of the reservoir, explained the type of agricultural uses that they would like to have considered. The two expanded factors that respondents thought were very important to consider in the management of the reservoir included: 1) cattle/water supply; and 2) overfilling and erosion causing problems for fences going down to the water level and the movement of the shoreline decreases pasture and farmland available to renters (Table 2).

Table 1: Responses to Question 1

	No response	Not at all important	Slightly important	Important	Very important	Extremely important
Maximum net economic benefits to Saskatchewan	2	0	1	10	10	8
Maximum net environmental benefits to Saskatchewan	2	0	0	10	10	9
Fish and aquatic habitat	1	0	3	11	9	7
Flood control	1	0	5	9	10	6
Hydroelectric production	2	1	4	11	10	3
Irrigation	2	4	4	7	6	8
Recreation downstream of the reservoir	2	2	7	16	2	2
Recreation on the reservoir	2	1	6	12	6	4
Slope stability and shoreline erosion	1	2	4	9	5	10
Water supply (municipal/urban distribution)	1	0	2	11	10	7
Water quality	1	1	2	5	11	11
Wildlife and terrestrial habitat	1	3	3	10	7	7

Table 2: Responses to the 'Other?' component of Question 1

	No response	Not at all important	Slightly important	Important	Very important	Extremely important
Other? (e.g., agricultural uses not related to irrigation) Please explain...	18	4	1	4	2	2

Question 2:
The development of a reservoir operating plan requires trade-offs in management decisions. Which criteria do you view as most important in developing the Reservoir Operating Plan. For each of the pair of selections below, please select the box that describes the option that is more important to your organization/community/First Nation.

Twenty-nine of the 31 respondents answered at least one component of Question 2. Responses for Question 2 indicate, as Question 1 points out, respondents feel that a lot of the services that the reservoir provides are important and should be considered when developing the Reservoir Operating Plan (Table 3). Based on the respondents responses the following factors are equivalent to nearly equivalent in importance when compared to each other: 1) hydroelectric power generation vs wildlife and terrestrial habitat; 2) hydroelectric power generation vs irrigation; 3) flood control vs wildlife habitat and terrestrial habitat; 4) flood control vs slope stability and erosion; 5) flood control vs irrigation; and 6) flood control vs drought resilience. When looking at trade-offs in water services, there were some answers that indicated respondents had preferences to one service over another, these comparisons included: 1) a preference to flood control over hydroelectric power generation; 2) a preference to fish and aquatic habitat over hydroelectric power generation; 3) a preference to flood control over recreation downstream of the reservoir; and 4) a preference to flood control over recreation on the reservoir (Table 3).

Looking at the responses in terms of preferences and rankings against each other, they fall out as follows (highest to lowest preferences): Flood Control, Drought Resilience, Fish and Aquatic Habitat, Irrigation, Hydroelectric Generation and Recreation.

Table 3: Responses to Question 2.

	Service one	Count of service one votes		Service two	Count of service two votes
a)	**Hydroelectric power generation**	12	vs	**Wildlife and terrestrial habitat**	12
b)	**Hydroelectric power generation**	10	vs	**Flood control**	16
c)	**Hydroelectric power generation**	9	vs	**Fish and Aquatic habitat**	15
d)	**Hydroelectric power generation**	11	vs	**Irrigation**	14
e)	**Flood Control**	12	vs	**Wildlife and terrestrial habitat**	10
f)	**Flood control**	15	vs	**Recreation downstream of the reservoir**	7
g)	**Flood control**	13	vs	**Slope stability and erosion**	11
h)	**Flood control**	16	vs	**Recreation on the reservoir**	8
i)	**Flood control**	13	vs	**Irrigation**	11
j)	**Flood control**	12	vs	**Drought Resilience for Municipal, Industrial, Irrigation Water Supply**	12

Question 3:
Given that the Watershed Authority (now Water Security Agency) has managed water releases to meet the various requirements/needs listed above, prioritizing based on historical uses, what would you suggest for a more formal review and updated operating process? As in, what criteria might be used to assess whether water should be released for particular activities?

All 31 respondents answered at least one component of Question 3. The majority of the respondents thought all of the criteria, with the exception of daily timing, were important to extremely important when assessing whether water should be released for particular activities. On average, seventy-eight percent of all responses were rated as important to extremely important for all 10 criteria in Question 3 (Table 4).

In decreasing order, the percentage of respondents felt that the following criteria were important to extremely important factors to assess whether water should be released for particular activities, include: safety (100%); ecosystem health (90%); seasonal timing (86%); flow level of year (drought or flood years) (86%); rate of flow (81%); loss of opportunity from other services (80%); quantity of flow (77%); economics (loss of revenue) (76%); shoreline erosion (70%) and daily timing (38%) (Table 4).

Table 4: Responses to Question 3.

	No response	Not at all important	Slightly important	Important	Very important	Extremely important
Safety	2	0	0	5	13	11
Loss of opportunity from other services	6	0	5	11	6	3
Economics (loss of revenue)	2	2	5	6	12	4
Daily timing	2	6	12	8	1	2
Seasonal timing	2	1	3	11	9	5
Rate of flow	0	0	6	11	8	6
Quantity of flow	1	0	7	11	8	4
Ecosystem health	2	0	3	9	9	8
Shoreline erosion	1	1	8	4	8	9
Flow level of year (drought or flood years)	3	0	4	9	11	4

Question 4:
What Lake Diefenbaker services does your organization/community/First Nation rely upon?

All 31 respondents answered Question 4. About 35% relied upon or valued the system primarily for recreational services, 13% primarily for irrigational services, 6% primarily for environmental services, 3% primarily for flood control services, 3% primarily for municipal/domestic water supply services, 3% primarily for ferries/riverboat services, 3% primarily for industrial services, 3% primarily for electrical production services, and 29% indicated that their organization/community/First Nation relies upon more than one of Lake Diefenbaker services (Table 5).

Seven respondents indicated that their organization/community/First Nation rely upon other Services. Of the seven respondents that indicated that they rely upon other services, they listed the following as other services: 1) fish/wildlife habitat, 2) aquatic environment, 3) electricity, 4) domestic water supply, 5) environmental benefits, and 6) high water table causing substantial land loss every year (Table 5).

Table 5: Responses to Question 4.

Number of responses	Service	Comments
17	**Recreation**	including: camping/boating/fishing, bird watching
11	**Irrigation**	
6	**Flood control**	
9	**Municipal water supply**	
3	**Ferries**	riverboat downstream
3	**Industrial**	
7	**Other?**	

Question 5:
Management decisions associated with reservoir water levels, downstream flows, and timing require trade-offs and the decisions are made in context of environmental, social, cultural and economic values. When making water management decisions, how important are the following factors to your organization/community/First Nation and its use of Lake Diefenbaker or the flows downstream of Lake Diefenbaker (Please check only one box per factor):

Thirty respondents answered at least one component of Question 5. The majority of the respondents thought all of the factors listed were important to extremely important to their organization/community/First Nation and its use of Lake Diefenbaker or the flows downstream of Lake Diefenbaker. On average, seventy-eight percent of all responses were rated as important to extremely important for the three factors of Question 5 (Table 6).

Based on the responses to Question 5, 70% of respondents indicated that Lake Diefenbaker water levels were a very important to extremely important factor to their organization/community/First Nation for making water management decisions. Sixty percent of respondents indicated that Timing of flows or water levels was a very to extremely important factor for making water management decisions. Downstream flow was considered to be a very important to extremely important factor to 36% of respondents (Table 6).

Table 6: Responses to Question 5.

	Not at all important	Slightly important	Important	Very important	Extremely important
Downstream flow	5	4	9	4	6
Lake Diefenbaker water levels	1	4	4	10	11
Timing of flows or water levels		5	7	8	10

Question 6:
How is your organization/community/First Nation affected by the water levels on Lake Diefenbaker?

Twenty-one respondents answered Question 6. Respondents indicated that there were nine general categories of how their organization/community/First Nation are affected by the water levels on Lake Diefenbaker, including: irrigation (20%); Fish/wildlife habitat and environmental interests (16%); recreation (16%); water supply (16%); water levels (12%); shoreline erosion (8%); electricity production (4%); flooding (4%); and water quality (4%) (Table 7). See Appendix 2, Question 6 for the verbatim responses to Question 6.

Table 7. Responses to Question 6.

Count	Service
5	Irrigation
4	Fish/wildlife habitat and environmental interests
4	Recreation
4	Water supply
3	Water levels (high and low)
2	Shoreline Erosion
1	Electricity production
1	Flooding
1	Water quality

Question 7:
What are the ideal minimum and maximum lake levels that your organization/community/First Nation requires and/or desires for their optimal use of Lake Diefenbaker (describe by season if it varies during the year)?

Twenty respondents answered Question 7. Eleven of the 20 respondents provided feedback on their ideal minimum lake levels (Table 8). Of the eleven responses, eight suggested a minimum water level ranging between approximately 550.00 metres above sea level (masl) to 552.87 masl. Two of the responses indicated that there needs to be some consideration for Piping Plover nesting habitat and drinking water and reservoir water supply when assessing the ideal minimum lake levels, and one responded indicated that their ideal maximum lake level is unknown, but ideal levels would not disrupt quantity/quality of source water (Table 8).

Fourteen respondents provided feedback on their ideal maximum lake levels (Table 9). Of the 14 responses, six suggested reducing the full supply level by 1 to 3 metres; two thought the current full supply level is okay; one suggested operating at the highest safe water level elevation; one wanted the water level to be high from May to August; another wanted the reservoir full in the summer; one respondent indicated that there needs to be some consideration for Piping Plover nesting habitat; one respondent wanted natural aquatic populations to be considered when assessing the ideal maximum lake levels; and one respondent indicated that their ideal maximum lake level is unknown, but ideal levels should not disrupt quantity/quality of source water (Table 9).

In addition to providing feedback on ideal minimum and maximum lake levels, eight respondents also discussed the fluctuations in Lake Diefenbaker's water levels. Of the eight respondents, six indicated that they would like to see a reduction in water level fluctuations, one respondent is fine with Lake Diefenbaker's variable water levels, and one respondent feels it is important for the water levels to fluctuate to provide for a variety of aquatic habitats (Table 10). See Appendix 2, Question 7 for the verbatim responses to Question 7.

Table 8. Responses to ideal minimum lake levels.

Count	Comments
2	Four metres below high water mark
1	No more than five metres below high water mark
1	Minimum level of 20 feet (6m) below high water level ~550.87
1	Ideal May 1st water level of 552 metres above sea level
1	Ideal minimum not to go below 1806 ft (550.47) metres above sea level
1	In the interests of Piping Plover nesting habitat ideal minimum would be 550 to 551 metres above sea level for mid-May
1	Higher water levels in April/May to provide fish with access to more spawning habitat.
1	Ensure a minimum level so as not to restrict drinking water and reservoir water supply
1	Unknown, levels that do not disrupt quantity/quality of source water
1	minimum levels "acceptable" to natural aquatic populations

Table 9. Responses to ideal maximum lake levels.

Count	Comments
6	Reduce full supply level by 1 to 3 metres below high water mark
2	Current full supply level is good
1	Operate at highest safe elevation
1	High lake levels May – August
1	Summer full
1	In the interests of Piping Plover nesting habitat the ideal maximum level would be 555-556 metres above sea level (with higher May levels accompanied by a smaller increase in levels in late May and June).
1	maximum levels "acceptable" to natural aquatic populations
1	Unknown, levels that do not disrupt quantity/quality of source water

Table 10. Responses to lake level fluctuations.

Count	Comments
6	Reduce fluctuations in mini and max water levels (more stable water levels)
1	Variable water levels are fine
1	Important for water levels to fluctuate somewhat to allow for different aquatic habitats to develop.

Question 8:
Is there a critical time frame for your organization/community/First Nation's use of Lake Diefenbaker?

Twenty-five respondents answered Question 8. Six of the respondents indicated that there was no one critical time frame for their organization/community/First Nation's use of Lake Diefenbaker. The remaining 19 respondents provided critical time frames that ranged from early in the spring until the end of summer (Table 11). See Appendix 2, Question 8 for the verbatim responses to Question 8.

Table 11. Responses to Question 8.

Count	Comments
1	There is no one critical time – Lake Diefenbaker (and area) is used extensively throughout the year by anglers, boaters, hunters, and other outdoor enthusiasts.
1	Seasonal spawning/breeding periods and rearing periods
2	No
1	We are only downstream
1	No, a minimum water level should be kept all year round
1	Yes
1	Coteau Creek is used for power generation and to provide ancillary services to operate the grid during the entire year. Critical periods within the year are peak electricity consumption periods, freeze-up and spring run-off periods. The spring run-off period is important in reduced spill at Gardiner Dam and coordinated releases with North Saskatchewan River flows to prevent spills at Nipawin and EB Campbell hydroelectric facilities.
1	Water supply is critical all year. However, spring is important, particularly in years of low precipitation for the Saskatoon South East Water Supply System (SSEWS) to operate and fill reservoirs as required. Due to the potential addition of BHP at Jansen and other potential potash mines, SaskWater will have earlier demands for water for the SSEWS system. SaskWater will require water one week earlier (April) and one week longer in the fall (October).
1	Need water level to rise earlier in the season
1	Spawn camp operations in spring – high waters are a determinant. Year round reliance of fish and aquatic organisms.
1	Optimum level at seeding time for irrigators to be able to pump
1	When not frozen
1	May 1 to July 31
1	From May long to Mid September
1	May – September
2	June – August
1	Summer
1	July - September
1	June to September
1	June, July, August, September
1	Spring and summer
1	May – August
1	July

Question 9:
What rate of water level changes cause problems with your use of Lake Diefenbaker?

Nineteen respondents answered Question 9. Five respondents (26%) indicated that the rate of change does not affect their use of Lake Diefenbaker; five respondents (26%) indicated low rates of change and low water levels affected their use of Lake Diefenbaker; and five respondents (26%) indicated rapid rates of water level change and high water levels affect their use of Lake Diefenbaker. The remaining four respondents each had rate of water level change problems, including: one respondent indicated that a three metre increase in water levels between May 12 and July 1 causes problems with Piping Plover nesting habitat; another respondent is concerned with the water level changes that affect fish spawning habitat; and the last respondent had no opinion on the rate of water level change that causes problems with their use of Lake Diefeenbaker. The last respondent indicated that they had problems using Lake Diefenbaker when no water is released in the evening. However, based on the comment we feel that they are likely talking about the impact this is having on their use of the river downstream of Gardiner Dam (Table 12). See Appendix 2, Question 9 for the verbatim responses to Question 9.

Table 12. Responses to Question 9.

Count	Rate of water level changes that cause problems with use of lake
5	Rate of change doesn't affect their use of Lake Diefenbaker
5	Low water rates and low water levels
5	Rapid rates of water level change and high water levels
1	A 3 metre increase in water levels between May 12 and July 1 affects Piping Plover nesting habitat
1	No water in the evening
1	Rates of water level change that affect fish spawning
1	No opinion

Question 10:
How does your organization/community/First Nation use the South Saskatchewan River or the water from the South Saskatchewan River?

Twenty-four respondents answered Question 10. Thirteen (54%) of the respondents indicated that they use the South Saskatchewan River for multiple purposes. Respondents indicated that their organization/community/First Nation use the South Saskatchewan River or the water from the South Saskatchewan River for potable and non-potable water supplies for domestic/municipal/industrial/livestock (33%), irrigation (28%), recreation/tourism/boating/sailing/fishing/parks/beaches (22%), Aquatic and terrestrial animal species/plants/Environment (8%), Electricity/economic benefits (3%), not applicable (3%), and yes (3%) (Table 13). See Appendix 2, Question 10 for the verbatim responses to Question 10.

Table 13. Responses to Question 10.

Count	Use the South Saskatchewan River
12	Potable and non-potable water supplies for domestic/municipal/industrial/livestock
10	Irrigation
8	Recreation/tourism/boating/sailing/fishing/parks/beaches
3	Aquatic and terrestrial animal species/plants/Environment
1	Electricity/economic benefits
1	Not applicable
1	Yes

Question 11:
How is your organization/community/First Nation affected by the flows of the South Saskatchewan downstream of Gardiner Dam?

Twenty respondents answered Question 11. Eight (40%) indicated that either the question was not applicable or that they are not affected by the flows of the South Saskatchewan River downstream of Gardiner Dam. The remaining 12 respondents indicated that they were primarily impacted by extreme low or high flows along the river (Table 14). See Appendix 2, Question 11 for the verbatim responses to Question 11.

Table 14. Responses to Question 11.

Count	Affected by the flows of the South Saskatchewan downstream of Gardiner Dam
4	Not applicable
4	It's not affected
2	Downstream flow impacts wildlife habitat/environment
1	We are affected by accessible water for drinking water treatment and flood control
1	Regional parks – infrastructure impacts
1	Not at all except if the lake drops too low
1	Our golf course gets flooded
1	The flows in the South Saskatchewan River can affect angler and hunter access to the fisheries and wildlife resources
1	High flows can impact the water pumps and water intakes
1	Variability is difficult for river pump sites
1	Disruption of municipal water supplies
1	Timing of the flows has significant impact on costs and security of Saskatchewan's electricity supply
1	Extreme lows or highs cause problems

Question 12:
What are the ideal minimum and maximum flows that your organization/community/First Nation requires and/or desires for optimal use of the South Saskatchewan River downstream of Gardiner Dam?

Seventeen respondents answered Question 12. Six (35%) of the respondents indicated that either the question was not applicable or that they are not affected by the flows of the South Saskatchewan River downstream of Gardiner Dam. Six of the 17 respondents to Question 12 provided feedback on their ideal minimum flows of the South Saskatchewan downstream of Gardiner Dam (Table 15). Of the six responses, three (50%) suggested a minimum flow between 62.3 m^3/s and 200 m^3/s. The remaining three respondents did not provide actual minimum flow values but rather stated that they wanted other services to be considered when evaluating the minimum flows, these services included: flows should closely reflect the natural and historic flow regimes of the South Saskatchewan River (drought/flood cycles); Flows that do not disrupt the quantity/quality of source water; and Minimum flows that can be "accommodated" by reservoir uses (Table 15). Eight respondents to Question 12 provided feedback on their ideal maximum flows (Table 16). Four of the eight respondents provided an ideal maximum flow ranging from 360 m^3/s to 1800 m^3/s. The remaining four respondents did not provide an actual maximum ideal flow but rather stated that they wanted other services to be considered when evaluating the maximum flows, these services included: flows should closely reflect the natural and historic flow regimes of the South Saskatchewan River (drought/flood cycles); flows should not exceed a level that causes flooding; flows that do not disrupt the quantity/quality of source water; and maximum flows that can be "accommodated" by reservoir uses. Both respondents who discussed the fluctuations in flows of the South Saskatchewan downstream of Gardiner dam indicated that they would like to see more consistent flows (Table 17). See Appendix 2, Question 12 for the verbatim responses to Question 12.

Table 15. Responses to ideal minimum flows.

Count	Comments
2	Minimum flow of 62.3 m^3/s
1	Minimum flow of 200 m^3/s
1	Flows should closely reflect the natural and historic flow regimes of the South Saskatchewan River (drought/flood cycles).
1	Unknown. Flows that do not disrupt the quantity/quality of source water.
1	Minimum flows that can be "accommodated" by reservoir uses

Table 16. Responses to ideal maximum flows.

Count	Comment
1	Maximum flow that can be passed through the turbines is approximately 360 m^3/s.
1	Maximum flow of 600 m^3/s
1	Maximum flow is 800 m^3/s
1	Maximum flow of 1800 m^3/s
1	Flows should closely reflect the natural and historic flow regimes of the South Saskatchewan River (drought/flood cycles).
1	Flows should not exceed a level that causes flooding
1	Unknown. Flows that do not disrupt the quantity/quality of source water.
1	Maximum flows that can be "accommodated" by reservoir uses

Table 17. Responses to fluctuations in flows.

Count	Comments
2	More consistent flows

Question 13:
Is there a critical time frame for your organization/community/First Nation's use of the South Saskatchewan River?

Nineteen respondents answered Question 13. Five (26%) of the respondents indicated that there is no critical time, and three of the five respondents indicated that there was no critical time as they use the river year round. Two (11%) of the respondents indicated that the question was not applicable to their organization. The remaining 12 (63%) of respondents either provided a range of dates, primarily spring to summer, for the time frame or the activities that they are involved in that they feel need to be considered when making management decisions (Table 18). See Appendix 2, Question 13 for the verbatim responses to Question 13.

Table 18. Responses to Question 13.

Count	Critical time frame
3	There is no critical time for use of the river, it is used year round
2	No
2	Not applicable
2	June – September
1	April – November
1	May – August
1	May to October inclusive
1	Summer (June/July/August)
1	Summer – i.e., no ice
1	High flows in summer cause our problems
1	Primarily spawning and rearing periods
1	Camping season
1	Minimum level needed for irrigation and higher levels favorable
1	Coteau Creek is used for power generation and to provide ancillary services to operate the grid during the entire year. Critical periods within the year are peak electricity consumption periods, freeze-up and spring run-off periods. The spring run-off period is important in reduced spill at Gardiner Dam and coordinated releases with North Saskatchewan River flows to prevent spills at Nipawin and EB Campbell hydroelectric facilities.

Question 14:
What rate of flow causes problems with your use of the South Saskatchewan River?

Seventeen respondents answered Question 14. Five (29%) of the respondents indicated that the questions was not applicable to their use. Two (12%) of the respondents indicated that low flow rates cause problems with their use of the South Saskatchewan River, and three (18%) of the respondents indicated that high flow causes problems. Five (29%) of the respondents indicated that both high and low flows cause problems. One (6%) of the respondents indicated that variability in flows is what causes problems and one respondent (6%) indicated that flows outside of the natural flow regimes, can cause problems with their use of the South Saskatchewan River (Table 19). See Appendix 2, Question 14 for the verbatim responses to Question 14.

Table 19. Responses to Question 14.

Count	Rate of flow that causes problems with your use of the South Saskatchewan River`
5	Not applicable
2	Low flow
1	Too high and too low
1	Should the water levels drop below the minimum water level and be high enough to cause flooding
1	Less than 100 m^3/s or more than 600 m^3/s
1	High rate of flows causes concerns as noted (impacts the pumps and intakes that SaskWater uses to supply customers). Flow below 63 m^3/s also will impact SaskWater's ability to pump water as that is very near to the bottom of their pump wells.
1	Rate of flow over the maximum that can be passed through the turbines means lost opportunity; the flows that cause issues vary as they depend on the flows of the North Saskatchewan River to determine total impact on the downstream generation. Low flow events tend to reduce the supply of water in the reservoir; reduction the capacity, energy capability and ancillary service capability at Coteau Creek. Low flow events will reduce the flexibility at EB Campbell as a larger percentage of the flow will have to be used to maintain the 75 m^3/s minimum flow.
1	High flow – turbidity
1	Over 800 m^3/s
1	Over 1,800 m^3/s gets to be too much
1	Variable, too high problematic (erosion, no beaches)
1	The Saskatchewan Wildlife Federation does not have any specific ideals for minimum and maximum flows, but the management of the lake and river should closely reflect the natural and historic flow regimes of the South Saskatchewan River (drought/flood cycles). All of the species of fish, wildlife and vegetation have adapted to the natural cycles of the river. If these cycles are disrupted, it can have grave impacts for biodiversity in the watershed.

Question 15:
On a seasonal basis, how often have your water level or flow needs been met?

Fifteen of the 31 respondents answered Question 15. On a seasonal basis, ten (67%) of the respondents felt that their water level or flow needs were met most of the time; Two (13%) of the respondents felt that their water level or flow needs were met more than 50% of the time, and two (13%) of the respondents indicated that their flow needs were met around 50% of the time. The remaining respondent provided an answer of no information (Table 20). See Appendix 2, Question 15 for the verbatim responses to Question 15.

Table 20. Responses to Question 15.

Count	Seasonally, how often have your water level or flow needs been met?
1	Not applicable
7	Most of the time
1	95% of the time
1	Most years (9/10 on Lake Diefenbaker)
1	SaskPower and WSA are in a constant dialogue with respect to target releases from Lake Diefenbaker. A larger percentage of the time WSA is in agreement with our needs, however there are occasions where WSA maintains and exercises their responsibility to govern releases for the betterment of the province.
1	70% to 80% of the time
1	40% to 50%
1	Every other season
1	No information

Question 16:
On an annual basis, how often are your water level or flow needs met?

Fifteen of the 31 respondents answered Question 16. Responses to Question 16 were essentially the same as those for Question 15. On a annual basis, ten (67%) of the respondents felt that their water level or flow needs were met most of the time; Two (13%) of the respondents felt that their water level or flow needs were met more than 50% of the time, and two (13%) of the respondents indicated that their flow needs were met around 50% of the time. The remaining respondent provided an answer of no information (Table 21). See Appendix 2, Question 16 for the verbatim responses to Question 16.

Table 21. Responses to Question 16.

Count	Seasonally, how often have your water level or flow needs been met?
1	Not applicable
7	Most of the time
1	95% of the time
1	Most years (9/10 on Lake Diefenbaker)
1	SaskPower and WSA are in a constant dialogue with respect to target releases from Lake Diefenbaker. A larger percentage of the time WSA is in agreement with our needs, however there are occasions where WSA maintains and exercises their responsibility to govern releases for the betterment of the province.
1	80% of the time
1	40% to 50%
1	Half year
1	No information

Question 17:
Within the past five years, how often were your water level or flow needs met?

Nineteen (61%) of the 31 respondents answered Question 17. Seven (37%) of the respondents indicated that their water level or flow needs have been met most of the time. Six (32%) of the respondents felt that their water level or flow needs were met more than 50%, but less than 75% of the time. Two (11%) of the respondents felt that their water level or flow needs have not been met in the past five years. The remaining three (16%) of the respondents felt that they did not have enough information to answer this question or that the question was not applicable to their use of Lake Diefenbaker or the South Saskatchewan River (Table 22). See Appendix 2, Question 17 for the verbatim responses to Question 17.

Table 22. Responses to Question 17.

Count	Within last five years, how often have your water level or flow needs been met?
1	5/5
1	Most of the time
1	Met as needed
1	Always
1	Most of the time
1	Most of the time
1	All years
1	SaskPower and WSA are in a constant dialogue with respect to target releases from Lake Diefenbaker. A larger percentage of the time WSA is in agreement with our needs, however there are occasions where WSA maintains and exercises their responsibility to govern releases for the betterment of the province.
1	70% of the time
1	50-60%
1	Recent years – high water level problems
1	3
1	Piping plover needs have been met 3 of the past 5 years
1	Usually a couple of high flow issues
1	Too full most of the time
1	Has been too full for five years
1	No information
1	Unknown
1	Not applicable

Question 18:
Lake Diefenbaker is a multi-use reservoir that provides some flood control benefits. However, there are trade-offs, for example if some of the reservoir's storage capacity is set aside for flood control this may reduce the amount of water that is available for irrigation, municipal use and hydroelectric power generation. Keeping this in mind, do you think the available water storage in Lake Diefenbaker should be decreased, stay the same or increased for flood control (or if you prefer should we provide 1 in 100, 1 in 500 protection)?

Nineteen (61%) of the 31 respondents answered Question 18. Five (26%) of the respondents felt that the available water storage should be decreased. Three of the five respondents that indicated that they wanted a decrease in water storage only wanted a slight decrease in storage, the remaining two respondents wanted a 1 metre and 1.5 metre decrease in Full Supply Level. Six (32%) of respondents felt that the available water storage should remain the same. Two (11%) of respondents indicated that they would like water storage in Lake Diefenbaker to increase. Five (26%) of respondents indicated that they would like water storage in Lake Diefenbaker to remain flexible (Table 23). See Appendix 2, Question 18 for the verbatim responses to Question 18.

Table 23. Responses to Question 18.

Count	Should available water storage in Lake Diefenbaker be decreased, stay the same or increased?
3	Decreased slightly
1	1 metre below high level mark
1	Decreased present maximum operating level by 1.5 metres
6	Remain the same
1	Increase
1	3 feet freeboard
1	1 in 100
1	1 in 100
1	Require flexibility
1	Storage capacity should as a minimum be maintained. A statistical probabilistic approach on a yearly basis could increase capacity. Questions related to these statements are: What is the value to the province for flood control? What level of flood control is currently provided to the Valley People Association, Muskoday First Nation, Residents of the City of Saskatoon and Cumberland House?
1	Given the fact that Lake Diefenbaker provides drinking water to over half of the province's population, it is probably in the best interest to focus more on drought protection than flood protection. The storage capacity of the reservoir could be increased, but with that coma number of other concerns (e.g., increased shoreline erosion, downstream sedimentation, property damage/loss, destruction of fish/wildlife habitat, etc.)
1	No

Question 19:
If special operations are desired to accommodate users, from time to time, what criteria or triggers should be used to decide whether a deviation from the operating plan is desirable? For example, what should the process be to request deviations? (this pertains to such things as lowering flows to accommodate work in the river channel at Saskatoon or boat races, etc.)

Seventeen (55%) of the 31 respondents answered Question 19. The majority of respondents (15 of 17 – 88%) understood that there will likely be circumstances where the Water Security Agency will be asked to and may comply to deviate from the normal operating plan. Two respondents indicated that they were not commenting on this question or that when a request is made, there should be no instances where deviations from the operating plan should occur. Two (13%) stakeholders prioritized deviations for infrastructure work as more important than deviations for recreational purposes (e.g., boat races) and one respondent indicated that criteria that should trigger deviation from operating plan should be a reasonable priority. Six (35%) of the respondents indicated that it was important for the Water Security Agency to manage the request based on flow and water level forecasting. Other criteria that stakeholders felt were important to consider when the Water Security Agency deviates from the operating plan to accommodate users include: safety (13%), the environment (18%), economics (6%), and irrigation considerations (6%). Three of the respondents indicated that it was important for buy-in from stakeholders and that there should be transparent communication and advanced warning to the public/stakeholders on any deviations that may occur (Table 24). See Appendix 2, Question 19 for the verbatim responses to Question 19.

Table 24. Responses to Question 19.

Count	What criteria should trigger deviation from operating plan? What should process be to accommodate deviation from operating plan?
2	Necessary infrastructure work more important than boat races
1	Reasonable priority/no squeaky wheels
6	Flow and water level forecasting
1	Safety and environment need to be considered first.
1	Safety comes first. Economics may come above/equal to ecosystem/environmental benefits
1	The environment needs to be considered
1	Irrigation considerations
1	Buy-in from the stakeholders
2	Transparent communication
1	No
1	No comment

Question 20:
Lake Diefenbaker has the ability to store water to provide a reserve supply in case of drought. Considering drought risks and possibility that climate change may affect drought risk, how important is it to your organization/community/First Nation that the lake be managed to ensure a reserve supply to meet needs through one year of drought?

Nineteen (61%) of the 31 respondents answered Question 20. The majority (74%) of respondents feel that it is important to extremely important to manage the reservoir to ensure a reserve supply to meet water needs during drought. Two respondents indicated that there needs to be consideration for the Piping Plovers and irrigation when making these decisions. One respondent indicated that there needs to be balance. The remaining two respondents did not feel that the question was applicable to their use of the reservoir and one respondent indicated that it was not important to their organization (Table 25). See Appendix 2, Question 20 for the verbatim responses to Question 20.

Table 25. Responses to Question 20.

Count	How important is it that the lake be managed to ensure a reserve supply to meet water needs during drought?
14	Important to extremely important
1	Must consider the flooding potential and the previous year's reproductive success of Piping Plovers
1	Two year plus supply for irrigation
1	Balance is important for all
1	Not applicable
1	It is not important to our organization

General feedback/comments:

Ten (32%) of the 31 respondents provided general feedback/comments. Two (20%) of the respondents suggested the need for improved flow and water level forecasting in the management of Lake Diefenbaker. Two (20%) of the ten respondents would like to ensure that the future growth for both tourism/recreation and economic development is considered in the renewal of the Lake Diefenbaker reservoir operating plan. One (10%) of the respondents indicated that it is important that flexibility is built into the operating plan. Another respondent recognized that the management of Lake Diefenbaker is multifaceted and has many different interests to try to accommodate. One respondent suggested the formation of a Lake Diefenbaker Reservoir Board or a water council that would likely include stakeholders from a diversity of interests (Table 26). See Appendix 2, Question General Feedback/Comments for the verbatim responses to the General Feedback/Comments section of the questionnaire.

Table 26. Responses to Question 18.

Count	General Feedback/Comments:
2	There are no easy answers. Suggestions for improved flow and water level forecasting.
2	Need to think into the future and the potential for growth in the province.
1	Flexibility needs to be built into the operating plan.
1	Concerns centered around: 1) Tourism, local activity and investment; 2) Boater safety; 3) flood control; 4) service life of reservoir; and 5) Environment and fish stocks
1	If flow and lake levels are kept at a consistent level all concerns can be accommodated
1	Too much water at once erodes the shoreline moving silt into irrigation sites
1	There could be a Lake Diefenbaker Reservoir Board or a water council
1	Thanks for the opportunity to share our perspective

Appendix 1: Questionnaire

Questions to Ponder Prior to Sector Specific Response Meetings

Your answers to these questions are important to help understand and shape the development of the reservoir operating plan. It is our expectation that, prior to attending your sector specific stakeholder response session, you will take some time as an organization/community/First Nation to ponder and, if possible, complete the following questionnaire. Please use additional pages for further comments. The answers you provide will assist us with developing the Lake Diefenbaker Reservoir Operating Plan.

The feedback and issues raised through the stakeholder consultation/engagement process will be compiled and summarized in a Stakeholder Consultation/Engagement Process Report. This written report will be posted on the Saskatchewan Watershed Authority's website.

1) As a stakeholder how do you think the Saskatchewan Watershed Authority should prioritize each of the following factors in the management of the South Saskatchewan River Project (please rate them according to your organization/community/First Nation's priority.

	Not at all important	**Slightly important**	**Important**	**Very important**	**Extremely important**
Maximum net economic benefits to Saskatchewan	❑	❑	❑	❑	❑
Maximum net environmental benefits to Saskatchewan	❑	❑	❑	❑	❑
Fish and aquatic habitat	❑	❑	❑	❑	❑
Flood control	❑	❑	❑	❑	❑
Hydroelectric production	❑	❑	❑	❑	❑
Irrigation	❑	❑	❑	❑	❑
Recreation downstream of the reservoir	❑	❑	❑	❑	❑
Recreation on the reservoir	❑	❑	❑	❑	❑
Slope stability and shoreline erosion	❑	❑	❑	❑	❑
Water supply (municipal/urban distribution)	❑	❑	❑	❑	❑
Water quality	❑	❑	❑	❑	❑
Wildlife and terrestrial habitat	❑	❑	❑	❑	❑
Other? (e.g., agricultural uses not related to irrigation) Please explain…	❑	❑	❑	❑	❑

2) The development of a reservoir operating plan requires trade-offs in management decisions. Which criteria do you view as most important in developing the Reservoir Operating Plan. For each of the pair of selections below, please select the box that describes the option that is more important to your organization/community/First Nation.

a) ❑ Hydroelectric power generation; ❑ Wildlife and terrestrial habitat
b) ❑ Hydroelectric power generation; ❑ Flood control
c) ❑ Hydroelectric power generation; ❑ Fish and Aquatic habitat
d) ❑ Hydroelectric power generation; ❑ Irrigation
e) ❑ Flood Control; ❑ Wildlife and terrestrial habitat
f) ❑ Flood control; ❑ Recreation downstream of the reservoir
g) ❑ Flood control; ❑ Slope stability and erosion
h) ❑ Flood control; ❑ Recreation on the reservoir
i) ❑ Flood control; ❑ Irrigation
j) ❑ Flood control ; ❑ Drought Resilience for Municipal, Industrial, Irrigation Water Supply

3) Given that the Watershed Authority has managed water releases to meet the various requirements/needs listed above, prioritizing based on historical uses, what would you suggest for a more formal review and updated operating process? As in, what criteria might be used to assess whether water should be released for particular activities?

	Not at all important	**Slightly important**	**Important**	**Very important**	**Extremely important**
Safety	❑	❑	❑	❑	❑
Loss of opportunity from other services	❑	❑	❑	❑	❑
Economics (loss of revenue)	❑	❑	❑	❑	❑
Daily timing	❑	❑	❑	❑	❑
Seasonal timing	❑	❑	❑	❑	❑
Rate of flow	❑	❑	❑	❑	❑
Quantity of flow	❑	❑	❑	❑	❑
Ecosystem health	❑	❑	❑	❑	❑
Shoreline erosion	❑	❑	❑	❑	❑
Flow level of year (drought or flood years)	❑	❑	❑	❑	❑

4) What Lake Diefenbaker services does your organization/community/First Nation rely upon?

- ❑ Recreation
- ❑ Irrigation
- ❑ Flood control
- ❑ Municipal water supply
- ❑ Ferries
- ❑ Industrial
- ❑ Other? Please explain: _____

5) Management decisions associated with reservoir water levels, downstream flows, and timing require trade-offs and the decisions are made in context of environmental, social, cultural and economic values. When making water management decisions, how important are the following factors to your organization/community/First Nation and its use of Lake Diefenbaker or the flows downstream of Lake Diefenbaker (Please check only one box per factor):

	Not at all important	**Slightly important**	**Important**	**Very important**	**Extremely important**
Downstream flow	❑	❑	❑	❑	❑
Lake Diefenbaker water levels	❑	❑	❑	❑	❑
Timing of flows or water levels	❑	❑	❑	❑	❑

6) How is your organization/community/First Nation affected by the water levels on Lake Diefenbaker?

7) What are the ideal minimum and maximum lake levels that your organization/community/First Nation requires and/or desires for their optimal use of Lake Diefenbaker (describe by season if it varies during the year)?

8) Is there a critical time frame for your organization/community/First Nation's use of Lake Diefenbaker?

9) What rate of water level changes cause problems with your use of Lake Diefenbaker?

10) How does your organization/community/First Nation use the South Saskatchewan River or the water from the South Saskatchewan River?

11) How is your organization/community/First Nation affected by the flows of the South Saskatchewan downstream of Gardiner Dam?

12) What are the ideal minimum and maximum flows that your organization/community/First Nation requires and/or desires for optimal use of the South Saskatchewan River downstream of Gardiner Dam?

13) Is there a critical time frame for your organization/community/First Nation's use of the South Saskatchewan River?

14) What rate of flow causes problems with your use of the South Saskatchewan River?

15) On a seasonal basis, how often have your water level or flow needs been met?

16) On an annual basis, how often have your water level or flow needs been met?

17) Within the past five years, how often were your water level or flow needs been met?

18) Lake Diefenbaker is a multi-use reservoir that provides some flood control benefits. However, there are trade-offs, for example if some of the reservoir's storage capacity is set aside for flood control this may reduce the amount of water that is available for irrigation, municipal use and hydroelectric power generation. Keeping this in mind, do you think the available water storage in Lake Diefenbaker should be decreased, remain the same or increased for flood control (or, if you prefer should we provide 1 in 100, 1 in 500 protection)?

19) If special operations are desired to accommodate users, from time to time, what criteria or triggers should be used to decide whether a deviation from the operating plan is desirable? For example, what should the process be to request deviations? (this pertains to such things as lowering flows to accommodate work in the river channel at Saskatoon or boat races, etc.)

20) Lake Diefenbaker has the ability to store water to provide a reserve supply in case of drought. Considering drought risks and possibility that climate change may affect drought risk, how important is it to your organization/community/First Nation that the lake be managed to ensure a reserve supply to meet needs through one year of drought.

General feedback/comments:

Appendix 2: Verbatim responses to open-ended questions

Question 6:
How is your organization/community/First Nation affected by the water levels on Lake Diefenbaker?

- Pump station inlets
- Irrigation and rural water
- Pumping cost high if water is low
- Ability to irrigate
- Access and cost of pumping
- Can impact spawn taking operation. Impacts successful production of fish species like pike – no flooding vegetation in spring when levels don't go up until June.
- Protection of net environmental benefits
- Fish and wildlife habitat availability vary greatly with water levels at Lake Diefenbaker. Low water levels on the reservoir make it difficult for anglers to access the lake. Extremely low water levels in the winter could create the potential for winterkill in years where there is little inflow.
- Water level impacts the viability of nesting habitat for shorebirds, especially for the piping plover. Lake Diefenbaker now provides a significant portion of the known nesting habitat for this species, and Saskatchewan hosts a significant proportion of the Canadian population.
- Boating facilities, beach facilities, shoreline erosion
- High water level limits recreation. Extremely low – cannot use boat launch
- Access, maintenance of facilities
- Important – Shoreline – Boating
- Drinking water supply to the downstream receivers (e.g. Saskatoon water treatment plant; water supply to Blackstrap Lake).
- Quality/quantity for municipal water supplies
- High and low water levels are most important!
- Erosion/high water
- Shoreline erosion
- The water level has a direct impact on the Coteau Creek Generation Station's energy production
- High water – spillway use floods our golf course
- No water, no people

Question 7:
What are the ideal minimum and maximum lake levels that your organization/community/First Nation requires and/or desires for their optimal use of Lake Diefenbaker (describe by season if it varies during the year)?

- In general, higher operating levels throughout the year provide better fish habitat and angler access to the fishery at Lake Diefenbaker. However, it is important for water levels to fluctuate somewhat to allow different habitats (both aquatic and terrestrial) to develop. There is no specific water level regime that our organization views as optimal; however, higher water levels in April/May would provide fish with access to more spawning habitat.
- In the interests of Piping Plover nesting habitat, minimum desirable lake level would be 550-551 metres above sea level (masl) for mid-May and the maximum for the same time would be 555-556 masl (with higher May levels accompanied by a smaller increase in levels in late May and June). This is really the most critical consideration related to lake levels from Nature Saskatchewan's perspective.
- Minimum/maximum levels "acceptable" to natural aquatic populations.
- May – September less than one metre variance, kept about one metre below full, no less than five metre below.
- One metre below high level mark.
- Over filling in summer and spillway use causes our problems
- Ideal level is to operate the reservoir at the highest safe elevation. Minimums are a function of the probabilistic requirements to prevent spill during runoff given the characteristics of each particular years flow pattern.
- Minimum level – 4 metre below high water mark, maximum level – 1 metre below high water mark
- Unknown. Levels that do not disrupt quantity/quality of source water. High better than low.
- Reduce maximum/minimum fluctuations
- Ideal minimum = 552 masl on May 1 and ideal maximum = 555.37 masl
- Minimum 1806 ft above sea level
- FSL
- Maintain at 10 to 20 feet down from high water level
- High lake levels May – August
- Consistent level would be more helpful
- The water levels may vary but ensure a minimum level so as not to restrict drinking water and reservoir water supply
- Spring filling/summer full
- The current FSLs are good. If to decrease it significantly this may pose a threat the community of Elbow's water supply due to the location of the current water intake. Lower operating levels may impact Saskatchewan Ministry of Agriculture's ability to supply water into the canal system that supplies the Saskatoon South East Water Supply System (SSEWS). Lower levels would also impact our power costs for pumping water into the SSEWS system.
- Needs to be in this range for less erosion and to be able to use facilities - one metre less at high level and draw down only four metres from high.

Question 8:
Is there a critical time frame for your organization/community/First Nation's use of Lake Diefenbaker?

- May 1 to July 31
- There is no one critical time – Lake Diefenbaker (and area) is used extensively throughout the year by anglers, boaters, hunters, and other outdoor enthusiasts.
- Seasonal spawning/breeding periods and rearing periods
- June – August
- No
- We are only downstream
- Coteau Creek is used for power generation and to provide ancillary services to operate the grid during the entire year. Critical periods within the year are peak electricity consumption periods, freeze-up and spring run-off periods. The spring run-off period is important in reduced spill at Gardiner Dam and coordinated releases with North Saskatchewan River flows to prevent spills at Nipawin and EB Campbell hydroelectric facilities.
- June to September
- No
- When not frozen
- June, July, August, September
- Yes
- Spring and summer
- Optimum level at seeding time for irrigators to be able to pump
- May – August
- June, July and August
- No, a minimum water level should be kept all year round
- July
- Water supply is critical all year. However, spring is important, particularly in years of low precipitation for the Saskatoon South East Water Supply System (SSEWS) to operate and fill reservoirs as required. Due to the potential addition of BHP at Jansen and other potential potash mines, SaskWater will have earlier demands for wter for the SSEWS system. SaskWater will require water one week earlier (April) and one week longer in the fall (October).
- Need water level to rise earlier in the season
- Spawn camp operations in spring – high waters are a determinant. Year round reliance of fish and aquatic organisms.
- From May long to Mid September
- May – September
- Summer
- July - September

Question 9:
What rate of water level changes cause problems with your use of Lake Diefenbaker?

- Levels can never be as low as those seen in spring and summer of 1988 (change of water was 0.78m diff between April 1 and June 21) and 1989 (change of water was 1.65m between April 1 and June 21)
- Rate doesn't matter
- Rate of change doesn't affect our organization
- Low
- Doesn’t really affect Ferry Park
- None
- Fast filling necessitates spillway use
- No water in the evening
- Low water rates and levels
- Low water levels cause problems to intake pumps
- High water table extreme land erosion
- High rates of change (>0.3m/day) endangers slope stability and increases erosion along the river reaches
- Previously discussed… Questionnaire comments on fish spawning and levels but not rate of water level change
- The rate of change does not cause issues (other than dam safety), it is more the timing of releases that effect the downstream generating stations.
- No opinion
- Rapid changes (hours/days) that do not allow movements/defection
- Slow rise in spring and access to water in low lake level years
- Rapid changes are negative
- No matter what the mid-May level is, it seems as though a 3m increase between May 12 and July 1 is the tipping point

Question 10:
How does your organization/community/First Nation use the South Saskatchewan River or the water from the South Saskatchewan River?

- Not applicable
- As a recreation/park site
- Irrigation/showers/washrooms
- Sailing
- Yes
- Drinking water/fishing
- We value the river's function of providing habitat for a wide range of natural species. We use the river for nature observation at various locations throughout the year, including the open water at the dam, but even those of us who may not "use" the river in this way would argue that its role in providing natural habitat should be a significant consideration. There is intrinsic value in nature itself, not to mention the significant role of natural water systems in relation to climate change.
- Irrigation
- Water supply for irrigation and tree development/recreation/boating/fishing
- To water grass/recreation/supply park with water
- Use it to supply customers. Downstream we supply potable and non-potable customers (Saskatoon area, Wakaw/Humboldt, Melfort, etc). Both municipal and industrial.
- Irrigation/domestic water supply
- Primarily for drinking water supply (Saskatoon) and also for reservoir and recreational water supply (Blackstrap Lake)
- Recreation/tourism/irrigation/potable water
- Irrigation
- Irrigation/rural water pipeline/recreation/livestock
- Sailing/boating/beach recreation/fishing
- Irrigation
- Recreation/irrigation to water trees in park
- Regulate municipal water
- Our town uses river water for residential use/irrigation is big industry in Outlook and vicinity
- Water from the reservoir is used to produce electricity, provide ancillary electrical services and economic benefits for the province
- The South Saskatchewan River provides year round habitat for numerous species of fish that are important to angling and ecological integrity. The river also provides habitat for terrestrial wildlife, birds, and many species of vegetation that have all adapted to the flood/drought cycles that have occurred historically. The river is used by anglers, hunters and other outdoor enthusiasts for the resources it provides. Of course, we also benefit from the municipal water resources provided by the river.
- Net environmental benefits

Question 11:
How is your organization/community/First Nation affected by the flows of the South Saskatchewan downstream of Gardiner Dam?

- Not applicable
- It's not affected
- It's not
- None
- We are affected by accessible water for drinking water treatment and flood control
- Regional parks – infrastructure impacts
- I live upstream
- Not applicable
- Not at all except if the lake drops too low
- Our golf course gets flooded
- The flows in the South Saskatchewan River can affect angler and hunter access to the fisheries and wildlife resources
- Not applicable
- Downstream flow impacts wildlife habitat. From our perspective, one noticeable impact is on bird habitat within the city of Saskatoon - geese, pelicans, etc.
- No negative effects
- If the flows are too high, it impacts the pumps and intakes that SaskWater uses to supply customers. Last year SaskWater was impacted by too high flows, where we had to shut our pumps down and reduce service to customers. The high flows shift and move sandbars within the river and therefore increase the sediment load. This causes excess wear and repairs to our pumping units, and impacts our pipeline operations due to sand settling out in the pipelines which increases maintenance costs.
- Variability is difficult for river pump sites
- Disruption of municipal water supplies
- Flows downstream of Gardiner Dam pass through two more generating stations. Timing of the flows has significant impact on costs and security of electricity supply
- Extreme lows or highs cause problems
- Protection of net environmental benefits

Question 12:
What are the ideal minimum and maximum flows that your organization/community/First Nation requires and/or desires for optimal use of the South Saskatchewan River downstream of Gardiner Dam?

- We are upstream. Flow doesn't matter, but we are notified
- 1 to 2 metres below high water level
- None
- The current minimum flow should be maintained to ensure access for drinking water treatment and maintain aquatic habitat. The flows should not exceed a level that causes flooding.
- Key – more consistent level (less variation)
- I live upstream
- Flow rate doesn't affect our organization
- Not applicable
- Ideal maximum is 800 m^3/sec
- The Saskatchewan Wildlife Federation does not have any specific ideals for minimum and maximum flows, but the management of the lake and river should closely reflect the natural and historic flow regimes of the South Saskatchewan River (drought/flood cycles). All of the species of fish, wildlife and vegetation have adapted to the natural cycles of the river. If these cycles are disrupted, it can have grave impacts for biodiversity in the watershed.
- Not applicable
- Minimum level is 62.3 m^3/s and maximum level at river pump station is approximately 1800 m^3/sec
- Consistent flows or adequate notice of changes
- Unknown. Levels that do not disrupt the quantity/quality of source water. High better than low
- Maximum flow that can be passed through the turbines is approximately 360 m^3/s. Flexibility to coordinate with North Saskatchewan River flows to help maintain downstream reservoirs close to full supply level
- 200 m^3/s to 600 m^3/s
- Min/max flows that can be "accommodated" by reservoir uses

Question 13:
Is there a critical time frame for your organization/community/First Nation's use of the South Saskatchewan River?

- Primarily spawning and rearing periods
- April – November
- Coteau Creek is used for power generation and to provide ancillary services to operate the grid during the entire year. Critical periods within the year are peak electricity consumption periods, freeze-up and spring run-off periods. The spring run-off period is important in reduced spill at Gardiner Dam and coordinated releases with North Saskatchewan River flows to prevent spills at Nipawin and EB Campbell hydroelectric facilities.
- No
- May – August
- No. All year
- There is no critical time for use of the river – it is used year round
- High flows in summer cause our problems
- June – September
- May to October inclusive
- I live upstream
- Summer (June/July/August)
- No
- June – September
- Camping season
- Fishing all year
- Minimum level need for irrigation and higher levels favorable
- Summer – i.e., no ice
- Not applicable

Question 14:
What rate of flow causes problems with your use of the South Saskatchewan River?

- Over 1800 m^3/s gets to be too much
- Not applicable
- Less than 100 m^3/s or more than 600 m^3/s
- Rate of flow over the maximum that can be passed through the turbines means lost opportunity, the flows that cause issues vary as the y depend on the flows of the North Saskatchewan River to determine total impact on the downstream generation. Low flow events tend to reduce the supply of water in the reservoir; reduction the capacity, energy capability and ancillary service capability at Coteau Creek. Low flow events will reduce the flexibility at EB Campbell as a larger percentage of the flow will have to be used to maintain the 75 m^3/s minimum flow.
- Low flow
- Too high and too low
- High rate of flows causes concerns as noted (impacts the pumps and intakes that SaskWater uses to supply customers). Flow below 63 m^3/s also will impact our ability to pump water as that is very near to the bottom of our pump wells.
- The Saskatchewan Wildlife Federation does not have any specific ideals for minimum and maximum flows, but the management of the lake and river should closely reflect the natural and historic flow regimes of the South Saskatchewan River (drought/flood cycles). All of the species of fish, wildlife and vegetation have adapted to the natural cycles of the river. If these cycles are disrupted, it can have grave impacts for biodiversity in the watershed.
- Over 800 m^3/s
- Not applicable
- Not applicable
- I live upstream
- Again variability.
- Should the water levels drop below the minimum water level and be high enough to cause flooding
- High flow – turbidity
- Low flow
- Not applicable

Question 15:
On a seasonal basis, how often have your water level or flow needs been met?

- Generally okay
- SaskPower and WSA are in a constant dialogue with respect to target releases from Lake Diefenbaker. A larger percentage of the time WSA is in agreement with our needs, however there are occasions where WSA maintains and exercises their responsibility to govern releases for the betterment of the province.
- 95% of time
- Most years (9/10 on Lake Diefenbaker)
- Most of the time
- Not applicable
- Always (Minimum does not cause problems)
- 10% to 80% of the time
- 40% to 50%
- Met as needed
- Every other season
- Most of the time
- Most of the time
- Majority
- No information

Question 16:
On an annual basis, how often are your water level or flow needs met?

- Generally okay
- SaskPower and WSA are in a constant dialogue with respect to target releases from Lake Diefenbaker. A larger percentage of the time WSA is in agreement with our needs, however there are occasions where WSA maintains and exercises their responsibility to govern releases for the betterment of the province.
- 95% of time
- Most years (9/10 on Lake Diefenbaker)
- Most of the time
- Not applicable
- Always
- 80% of the time
- 40% to 50%
- Met as needed
- Half year
- Most of the time
- Most of the time
- Majority
- No information

Question 17:
Within the past five years, how often were your water level or flow needs met?

- Usually a couple of high flow issues
- SaskPower and WSA are in a constant dialogue with respect to target releases from Lake Diefenbaker. A larger percentage of the time WSA is in agreement with our needs, however there are occasions where WSA maintains and exercises their responsibility to govern releases for the betterment of the province.
- Unknown
- 5/5
- Most of the time
- Not applicable
- Always
- 70% of the time
- 50-60%
- Met as needed
- Recent years – high water level problems
- 3
- Most of the time
- Most of the time
- All years
- No information
- Piping plover needs have been met 3 of the past 5 years
- Has been too full for five years
- To full most of the time

Question 18:
Lake Diefenbaker is a multi-use reservoir that provides some flood control benefits. However, there are trade-offs, for example if some of the reservoir's storage capacity is set aside for flood control this may reduce the amount of water that is available for irrigation, municipal use and hydroelectric power generation. Keeping this in mind, do you think the available water storage in Lake Diefenbaker should be decreased, stay the same or increased for flood control (or if you prefer should we provide 1 in 100, 1 in 500 protection)?

- 1 metre below high level mark
- No
- Decreased
- Decreased slightly and maintained within limits
- Remain the same
- The same, unless predicted "running average" flood events could not be managed
- 3 feet freeboard
- Remain the same to a little higher
- Decreased somewhat
- Require flexibility
- Decreased present maximum operating level by 1.5 metres
- Remain approximately the same
- 1 in 100
- Given the fact that Lake Diefenbaker provides drinking water to over half of the province's population, it is probably in the best interest to focus more on drought protection than flood protection. The storage capacity of the reservoir could be increased, but with that coma number of other concerns (e.g., increased shoreline erosion, downstream sedimentation, property damage/loss, destruction of fish/wildlife habitat, etc.)
- Stay the same. A consistent supply is more important to SaskWater to ensure that the corporation can supply its customers.
- Remain the same.
- Increase
- Storage capacity should as a minimum be maintained. A statistical probabilistic approach on a yearly basis could increase capacity. Questions related to these statements are: What is the value to the province for flood control? What level of flood control is currently provided to the Valley People Association, Muskoday First Nation, Residents of the City of Saskatoon and Cumberland House?
- 1 in 100

Question 19:

If special operations are desired to accommodate users, from time to time, what criteria or triggers should be used to decide whether a deviation from the operating plan is desirable? For example, what should the process be to request deviations? (this pertains to such thighs as lowering flows to accommodate work in the river channel at Saskatoon or boat races, etc.).

- Necessary infrastructure work more important than boat races
- Safety and environment need to be considered first. An economic evaluation can be performed to evaluate the impact on Saskatchewan residents and that the impact is in line what the significant of the use.
- Buy-in from the stakeholders
- WSA decision – taking into account the pros and call of all uses
- Construction or critical infrastructure (i.e., bridges), some recreation activities (not all, i.e., Boat races) to maintain lake and reservoir levels
- Deviations from the normal operating plan should only happen in rare circumstances. As stated earlier, releases from Gardiner Dam should reflect "natural" flow regimes. Any deviations to the operation must not have negative impact to fish or fish habitat.
- Common sense on a case by case basis. Advance warning of upcoming events must be attained
- Flood control should have precedent above all
- No comment
- If necessary work is required, water levels should be managed accordingly
- Only deviate enough that it does not affect the rest
- Reasonable priority/no squeaky wheels
- Safety comes first. Economics may come above/equal to ecosystem/environmental benefits
- Flow and water level forecasting based on headwater basin runoff and discharge conditions
- No
- Transparent communication with parks

Irrigation considerations

Question 20:
Lake Diefenbaker has the ability to store water to provide a reserve supply in case of drought. Considering drought risks and possibility that climate change may affect drought risk, how important is it to your organization/community/First Nation that the lake be managed to ensure a reserve supply to meet needs through one year of drought?

- Very important
- Not applicable
- Very important
- Important to have a reserve
- In years where the increase in water levels between mid May and July 1 is expected to be less than 3 metres, a very high reserve (nearly maximum capacity) could be tolerated by plovers. However, once water levels more than 3 metres during this same time period, the risk to plover success is very high, no matter what the initial May 12 level is. We would not want to see this happen year after year. We would recommend an annual assessment that includes consideration of the previous year's plover success.
- Very
- This is extremely important. Low water supply can greatly impede our quality of life and cause economic hardship.
- Two year plus supply for irrigation
- Most highest of importance
- Very important if maintained at a respectful level
- Balance is important for all
- It is not important to our organization
- Extremely important
- Since so many people in Saskatchewan rely on Lake Diefenbaker for their drinking water supply, it is critical that the lake has some storage capacity to deal with future droughts. Given this face, drought protection at Lake Diefenbaker should take a higher priority than downstream flood protection. Supplementary to this operating plan, all municipalities that rely on this water should develop plans to deal with water shortages in the event that we experience a multi-year drought. The province should also develop clear and enforceable water conservation strategies that can be implemented when necessary
- This is critical to the services that we provide. Must ensure a reliable supply of potable water to communities, followed by meeting water requirements for the reservoirs supplied by the SSEWS. Finally must meet supply requirements for industrial customers for production purposes, i.e., potash mines
- Very important
- Very important
- Drought planning is extremely important to SaskPower; low flows over the year have a major impact to the operation of the Hydro generation stations. Cost savings associated with storing water for a drought year go to all electrical rate payers in Saskatchewan.
- Quite important

Very important

General feedback/comments:

- If it is kept at a consistent level no problems, all concerns can be accommodated
- Too much water at once erodes the shoreline moving silt into irrigation sites
- Main concern is ensuring that potential industry needs are met. We need to determine a way to ensure allocation decisions maximize economic/social direction of Cabinet
- There are no easy answers. However, we feel that monitoring of snow pack and runoff could be more precisely monitored. When the lake is high power generation should be kept at a maximum. This doesn't seem to happen as flows through Outlook vary greatly over a 24 hour period.
- Thank you for the opportunity to share our perspective
- Please keep a better watch of the flow gauges along the South Saskatchewan River upstream of Lake Diefenbaker. There is some lead time between water flowing from the headwaters to Lake Diefenbaker (approximately 2 weeks). This is ample time to operate the Gardiner Dam in such a manner as to compensate for some flow extremes that may be caused by the headwater discharge conditions. Another suggestion is to install additional gauges and implement state-of-the-art computer modeling tools to improve flow and water level forecasting.
- Need to think about the future and the potential for growth in the province and in particular on Lake Diefenbaker.
- Could be a Lake Diefenbaker Reservoir Board or a water council
- Lake Diefenbaker yacht Club (LDYC) provided a letter to WSA and to the Honorable Minister Chevyldayoff outlining their concerns that centered around: 1) Tourism, local activity and investment; 2) Boater safety; 3) flood control; 4) service life of reservoir; and 5) Environment and fish stocks. 1) Tourism concerns: When water level is at full supply level people stop coming to the lake and this causes a negative economic impact; concern of coulees silting in; concern over property development and shoreline erosion. 2) Boater Safety: Lower lake levels create an area of refuge near shore in event of mechanical breakdown or man over board; High water level increases shoreline erosion. 3) Flood control: suggest for a lower operating lake water level that will afford a chusion in the event of unexpected rainfall upstream and/or mitigation of errors in snowpack runoff calculations. 4) Service Life of the reservoir: Lower water levels mean less shoreline erosion, which means less siltation, which means longer service life of reservoir. 5) Environmental Preservation and Fish stocks: Erosion at high water levels contributes to silt and particulate matter suspension that will impede fish reproduction and health.
- SaskPower would like to see some flexibility built into the operating plan. System conditions and hydrological conditions can be quite varied and using a probabilistic approach along with the economic impact of a proposed change to make decisions when considering other stakeholders.