WINNIPEG SEWAGE TREATMENT PROGRAM

SOUTH END PLANT

PAGE 1/20	**Commissioning plans**

Rev	NATURE OF REVISION	DATE	MADE	APPROVED
A	ISSUE FOR PSR	21/01/11	ASI	

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2. INTRODUCTION

The 3 pre-selected options for SEWPCC extension and upgrade project are:

- option 2: AS / BNR / MJ / IFAS
- option 3: AS / BNR / BAF (N) / BAF (PDN)
- option 4: BAF (NDN) / BAF (PDN)

The purpose of the present document is to :

- Determine the risks and difficulties expected during the commissioning of the options
- Creat e a first draft of commissioning schedule
- Assess the ability of commissioning with and without the existing plant operating

Being at a very early stage of design, the delays given in the present document are for information and comparison between the options only.

3. COMMISSIONING DURATION

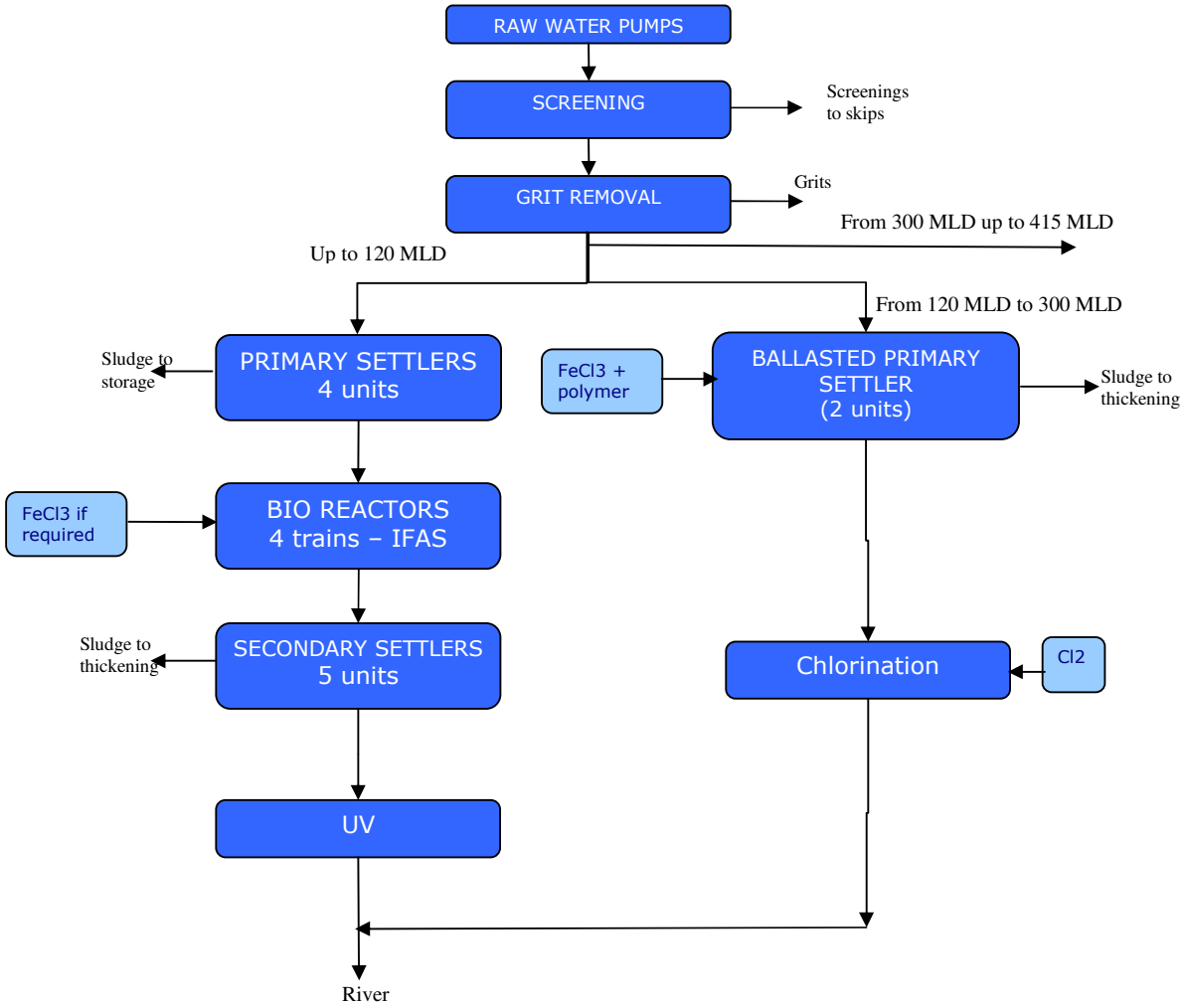
For options 2 and 3, CEPT will be considered as alternatives for the main treatment line. For the option 4, the alternative will the existing plant.

Table 1 : commissioning duration for the 3 options

4. OPTION 2: AS/BNR/MJ/IFAS

4.1. Process

- Preliminary treatment
  - - raw water pumping plant
  - - screening (6mm)
  - - sand removal
- Treatment (120,000 m3/d)
  - - 4 primary clarifiers (3 existing + 1 new)
  - - 4 IFAS with bioP including the refurbishment of the existing basins
  - - 5 secondary clarifiers (3 existing + 2 new)
  - - UV treatment
- CSO (120,000 – 300,000 m3/d)
  - - Ballasted primary clarification (2 units)
  - - Chemical disinfection
- Sludge treatment
  - Thickening for biological and Ballasted Primary Settler sludge
  - Storage tanks
  - Truck loading facilities


RAW WATER PUMPS
SCREENING
Screenings to skips
GRIT REMOVAL
Grits
From 300 MLD up to 415 MLD
Up to 120 MLD
From 120 MLD to 300 MLD
Sludge to storage
PRIMARY SETTLERS 4 units
FeCl3 + polymer
BALLASTED PRIMARY SETTLER (2 units)
Sludge to thickening
FeCl3 if required
BIO REACTORS 4 trains – IFAS
Sludge to thickening
SECONDARY SETTLERS 5 units
Chlorination
Cl2
UV
River

4.2. Risks

The risk is an hydraulic risk as explained below :

- Hydraulic distribution in biological basins of different size
- RAS distribution
- Mandatory temporary connexions between existing plant and new works.

This will imply an additional delay in commissioning.

4.3. Duration

☞ About 6 months + the duration of the refurbishment of the existing basins into non aerated basins.

☞ Existing plant will be running during commissioning => longer commissioning and temporary connexions expected.

4.4. Phasage

Stage 0: Precondition

☞ Test of the bypass for > 300,000 m3/d => closing of the penstocks for the ballasted primary clarifiers (CSO) and the primary clarifiers.

☞ Test of the bypass for > 120,000 m3/d => closing of the penstocks for the primary clarifiers.

- Pre-commissioning of the ballasted primary clarifiers and chlorine injection
- Supply of the reagents for ballasted primary clarifiers
- Supply of chlorine and security in the chlorination area

☞ Test of the bypass for entrance in the biological aerated area

Stage 1: Test with clear water

☞ Hydraulic tests by diverting some water treated to fill in the works and test the hydraulic links. Filling of :

- 2 ballasted primary clarifiers
- Chlorination basins
- primary clarifiers # 4
- non aerated biological basins
- 4 IFAS
- 2 new secondary clarifiers

☞ High test of the blades of spillways

Stage 2: Validation of the failure alternative: ballasted primary clarification from CSO

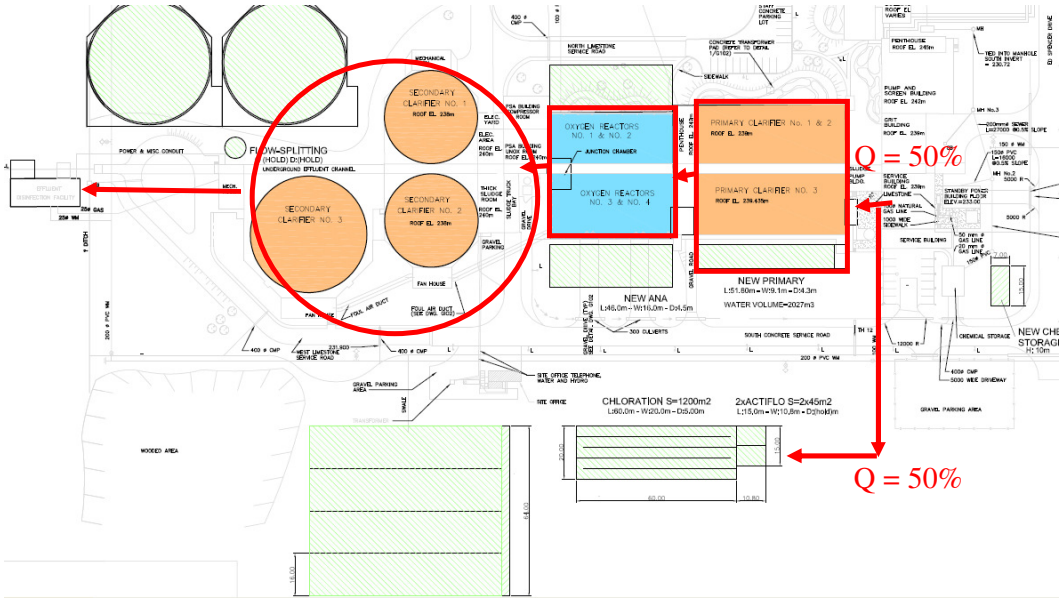
☞ Kickoff 4th (new) primary clarifier

☞ Kickoff of 2 ballasted primary clarifiers by splitting the flow :

a. start ballasted primary clarifiers with 50 % of the nominal flow
b. test with 100 %
c. start up of the ballasted primary clarifiers and chlorination still by splitting the flow between the existing plant and the CSO (~ 1 week)

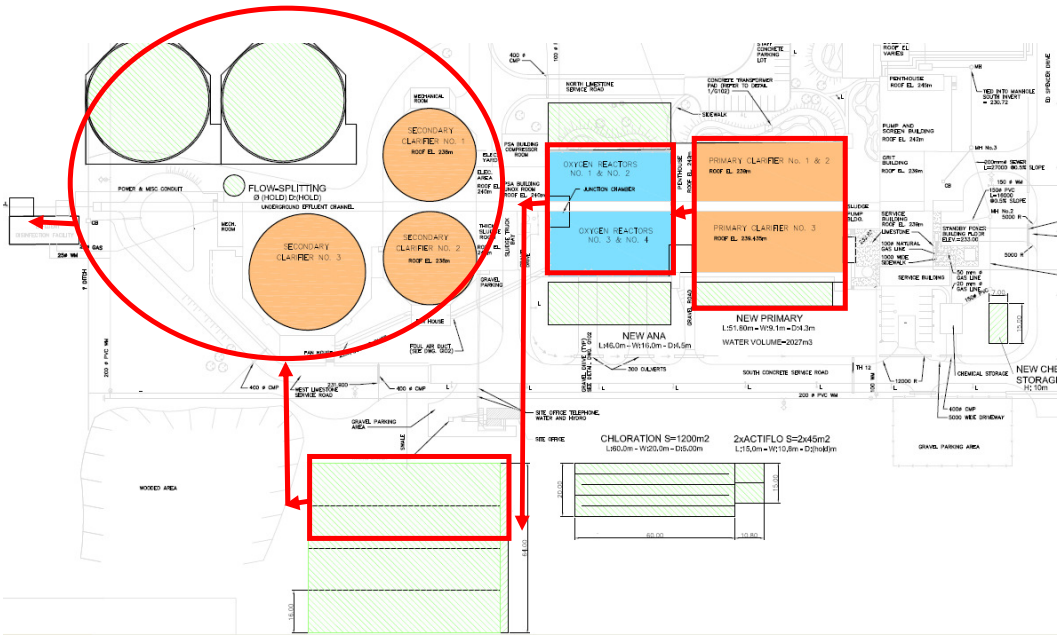
The purpose of this stage is to validate the behavior of the ballasted primary clarifiers in case of failure.

☞ Existing plant under normal conditions. Flow reduced by 50% for CSO ballasted primary clarifiers (~ 1 week).



Stage 3: Commissioning of secondary clarifiers – Commissioning IFAS 1 and 2

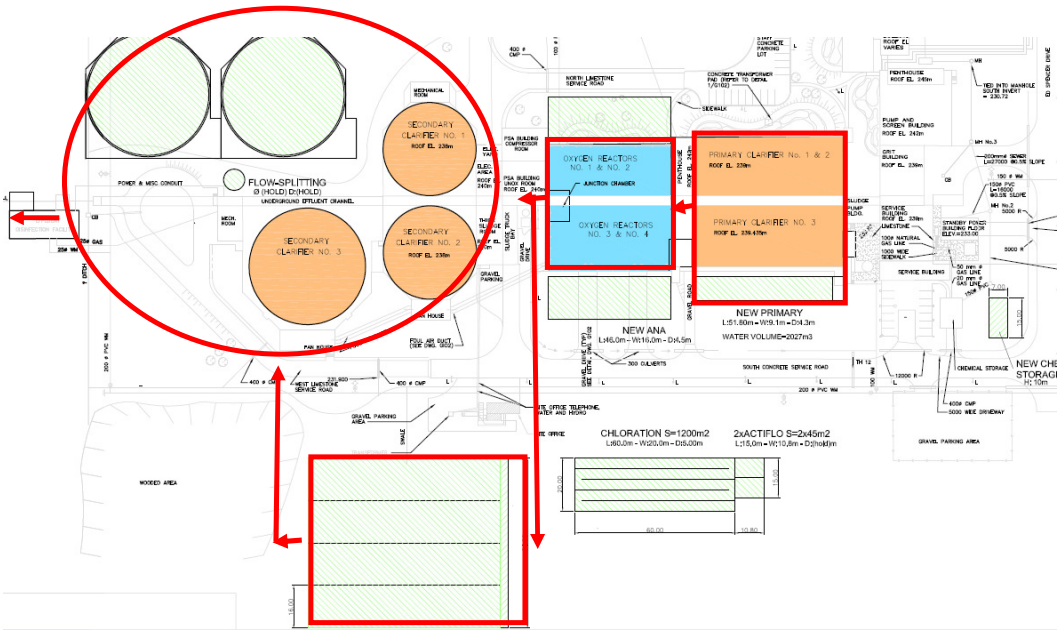
- ☞ Kickoff of the 2 new secondary clarifiers
- ☞ Kickoff of the 2 aerated basins IFAS (7,500m3)
- ☞ Isolation of the RAS entrance into the 2 new non aerated basins
- ☞ Normal running of the two existing biological basins
- ☞ No RAS recirculation into the non aerated basins (QML = 150%Qinlet) because of the hydraulic risk as long as the 4 non aerated basins are operational.



Stage 4: Commissioning IFAS 3 and 4

- ☞ Progressive reduction of aeration in the existing basins to the point of not aerating at all (support minimum agitation). Aeration will be mainly done by IFAS.

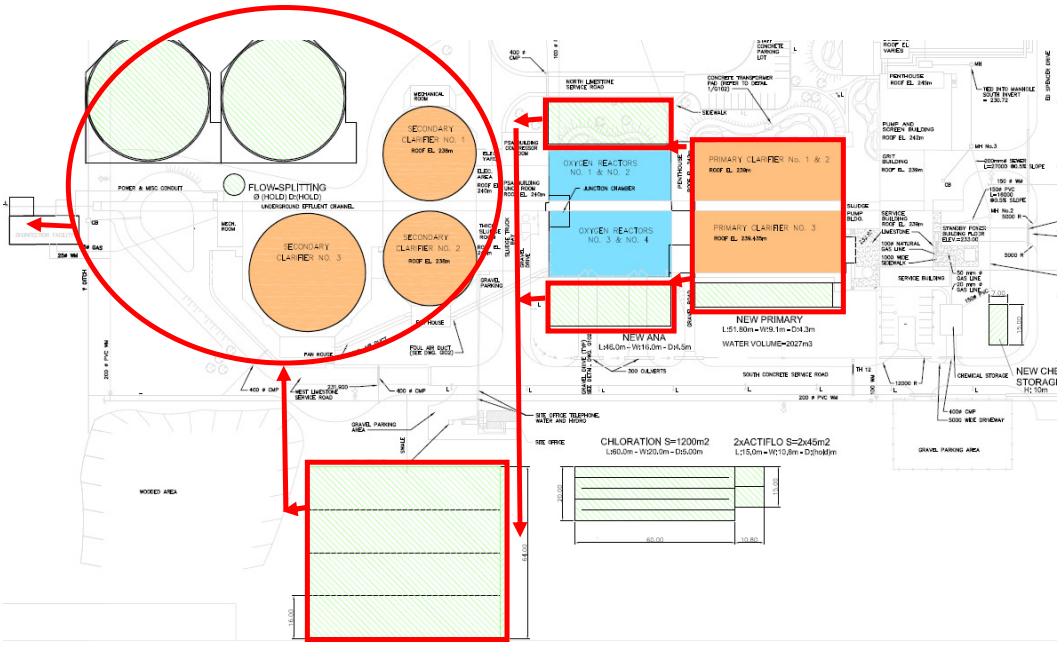
☞ Once IFAS 1 and 2 sowed, IFAS 3 and 4 will be put under way.



Stage 5: Commissioning of the 2 new non aerated basins

☞ Switch of the 2 existing basins to the new non aerated basins:

- Open penstocks for the new non aerated basins and recirculate the RAS into these basins.
- Stop the RAS into the existing basins, while supporting the entrance of clarified water during 24 - 48 h. It will have the effect of getting RAS into the IFAS and thus maintaining the sludges. After 24 - 48 h, closing of the penstocks at the entrance of basins to be rehabilitated. The emptying of the existing non aerated basins will be made easier, it will be enough to pump the clarified water of these basins into the neighbouring non aerated basins.



Stage 6: refurbishment works of the non aerated basins

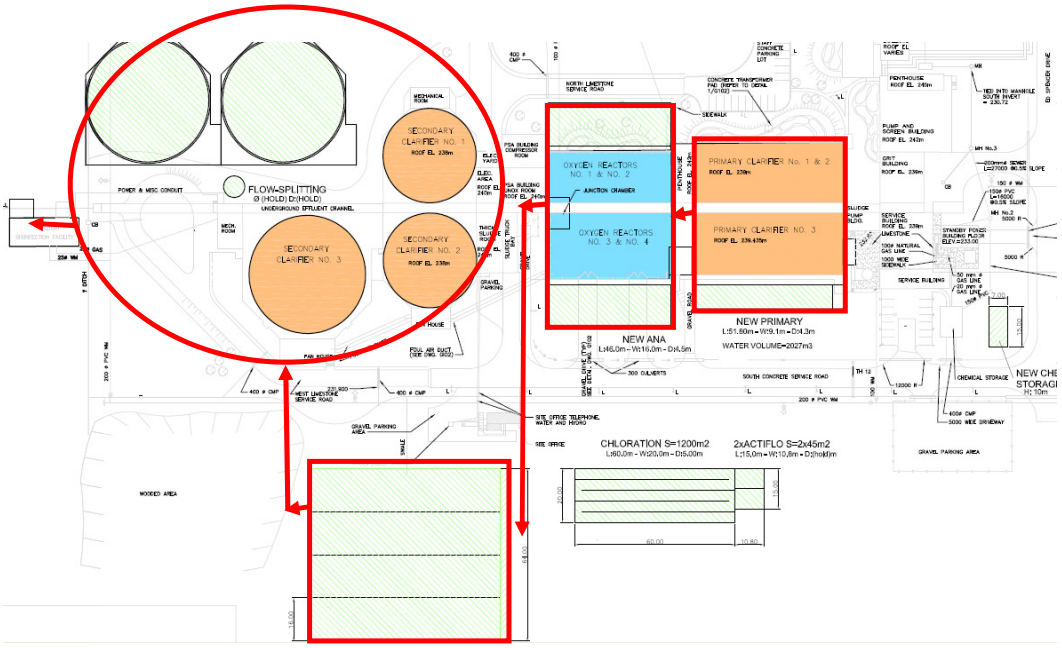
☞ Accomplish works on basins to be rehabilitated

Stage 7: Kickoff of the pre denitrification

☞ When works of rehabilitation and hydraulic test of the non aerated basins are done, then start up these basins with return of the RAS.

☞ Start up of the recirculation of RAS in the 4 not aerated basins : kickoff of the denitrification.

☞ Kickoff if the FeCl3 injection



Stage 8: Commissioning of UV desinfection

- Start up of the UV. Possible from stage 3 according to the quality of effluent.

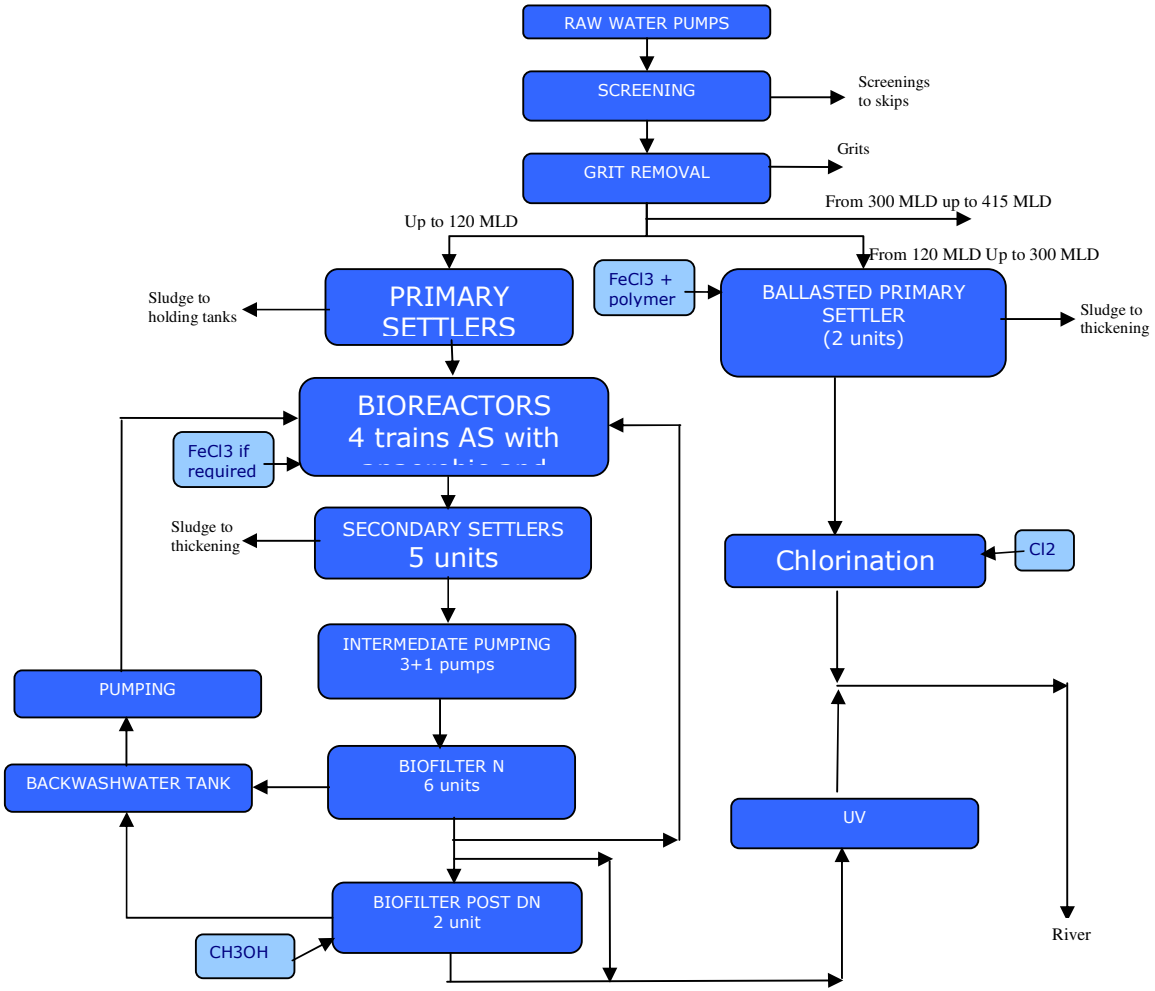
Stage 9: Stabilization

- Stabilization of biomass and process optimization

5. OPTION 3 : ACTIVATED SLUDGES AND BAF

5.1. Process

- Headworks
  - Raw water pumps
  - Fine screens (6 mm punched-holes)
  - Grit removal
- BNR line (120 MLD)
  - 4 Primary clarifiers (3 existing + 1 new)
  - 4 Intermediate load Activated Sludge (AS) with anaerobic and anoxic tanks including refurbishment of existing HPO reactors
  - 5 Secondary clarifiers (3 existing + 2 new)
  - 6 Biofilters N
  - 2 Biofilter Post DN
  - UV treatment
- Excess Flows line
  - Ballasted Primary clarification (2 units)
  - Chemical disinfection


RAW WATER PUMPS
SCREENING
Screenings to skips
GRIT REMOVAL
Grits
From 300 MLD up to 415 MLD
Up to 120 MLD
From 120 MLD Up to 300 MLD
Sludge to holding tanks
PRIMARY SETTLERS
FeCl3 + polymer
BALLASTED PRIMARY SETTLER (2 units)
Sludge to thickening
BIOREACTORS 4 trains AS with
FeCl3 if required
Sludge to thickening
SECONDARY SETTLERS 5 units
Chlorination
Cl2
INTERMEDIATE PUMPING 3+1 pumps
PUMPING
BACKWASHWATER TANK
BIOFILTER N 6 units
UV
BIOFILTER POST DN 2 unit
CH3OH
River

5.2. 4.2. Risks

- Hydraulic risk:
  - hydraulic distribution into biological basins of different size
  - Splitting of the RAS
  - Compulsory temporary connexions between existing and new plant
  - An additional time will be necessary for the commissioning in order to deal with these distributions.

- Risk of interference between activated sludge and BAF in case of dysfunctions of secondary clarifiers.

- Delay due to the sum of the sowing period of the different biological units:
  - Stabilization of the new AS with new secondary clarifiers (expected TSS <80mg/l)
  - Sowing of BAF. AS must be stable and liable to feed continuously the BAF with a controlled load
  - Stabilization of the AS after RAS recirculation. Kickoff of the pre denitrification only when the recirculation of nitrates towards non aerated basins are performed.
  - Stabilization of BAF with new influent from AS.

- Delay due to M&E:
  - o The time for start up of the M&E will be almost doubled in comparison with a BAF option.

5.3. 4.3. Duration

- About 7 - 8 months + time for refurbishment of the existing basins into non aerated basins.
- Existing plant running => longer start up and temporary connexions to expect.

5.4. Phasage

Stage 0: Precondition

- Test of the bypass for > 300,000 m3/d => closing of the penstocks for the ballasted primary clarifiers (CSO) and the primary clarifiers.
- Test of the bypass for > 120,000 m3/d => closing of the penstocks for the primary clarifiers.
  - Pre-commissioning of the ballasted primary clarifiers and chlorine injection
  - Supply of the reagents for ballasted primary clarifiers
  - Supply of chlorine and security in the chlorination area
- Test of the bypass for entrance in the biological aerated area

Stage 1: Test with clear water (3-4 weeks)

- Hydraulic tests by diverting some water treated to fill in the works and test the hydraulic links. Filling of :
  - 2 ballasted primary clarifiers
  - Chlorination basins
  - primary clarifiers # 4
  - non aerated biological basins
  - Aerated biological basins
  - 2 new secondary clarifiers
- High test of the blades of spillways

Stage 2: Validation of the failure alternative: ballasted primary clarification from CSO

- Kickoff 4th (new) primary clarifier
- Kickoff of 2 ballasted primary clarifiers by splitting the flow :
  d. start ballasted primary clarifiers with 50 % of the nominal flow
  e. test with 100 %
  f. start up of the ballasted primary clarifiers and chlorination still by splitting the flow between the existing plant and the CSO (~ 1 week)

The purpose of this stage is to validate the behavior of the ballasted primary clarifiers in case of failure.

Stage 3: Commissioning of secondary clarifiers – Commissioning AS 1 and 2

- Kickoff of the 2 new secondary clarifiers
- Kickoff of the 2 aerated basins
- Isolation of the RAS entrance into the 2 new non aerated basins

Stage 4: Commissioning AS 3 and 4

- Progressive reduction of aeration in the existing basins to the point of not aerating at all (support minimum agitation). Aeration will be mainly done by IFAS.
- Once AS 1 and 2 sowed and stable, AS 3 and 4 will be put under way.

Stage 5: Commissioning of the 2 new non aerated basins

- Switch of the 2 existing basins to the new non aerated basins:
  - Open penstocks for the new non aerated basins and recirculate the RAS into these basins.
  - Stop the RAS into the existing basins, while supporting the entrance of clarified water. It will have the effect of getting RAS into the aerated biological basins and thus maintaining the sludges. The emptying of the existing non aerated basins will be made easier.

Stage 6: refurbishment works of the non aerated basins

- Accomplish works on basins to be rehabilitated

Stage 7: Commissioning rehabilitated basins

- When rehabilitation works and hydraulic test of the non aerated basins are finished, start up of the basins with RAS recirculation.

Stage 8: Commissioning BAF and sowing

- Progressively the flow from secondary clarifiers to BAF is going to be augmented from 0 to 100 % in 6 - 7 weeks to insure an optimum sowing of BAF N, and the bypass flow of BAF will be diminished.

~ 2 weeks { ~25%[1] of the flow to N-BAF
~75% bypass

~ 2 weeks { ~50% of the flow to N-BAF
~50% bypass

Start up of the 2 PDN BAF : ~10% of the downstream flow from N-BAF (depending on loads)
Start up of recirculation of nitrates into AS basins.

~ 2 weeks { 75% of the flow to N-BAF
25% of the flow into existing biological basins

Sowing of PDN-BAF : 20% of the downstream flow from N-BAF (depending on loads)

~ 1 week { 100% of the flow to N-BAF
0% bypass

[1] Pourcentage donné à titre indicatif. Chiffre réel lors de la MER avec mesures de la charge réelle

Sowing of PDN-BAF : 25% (min) of the downstream flow from N-BAF (depending on loads)

Stage 9: Commissioning of UV desinfection

- ☞ Start up of the UV. Possible from middle of stage 8 according to the quality of effluent.

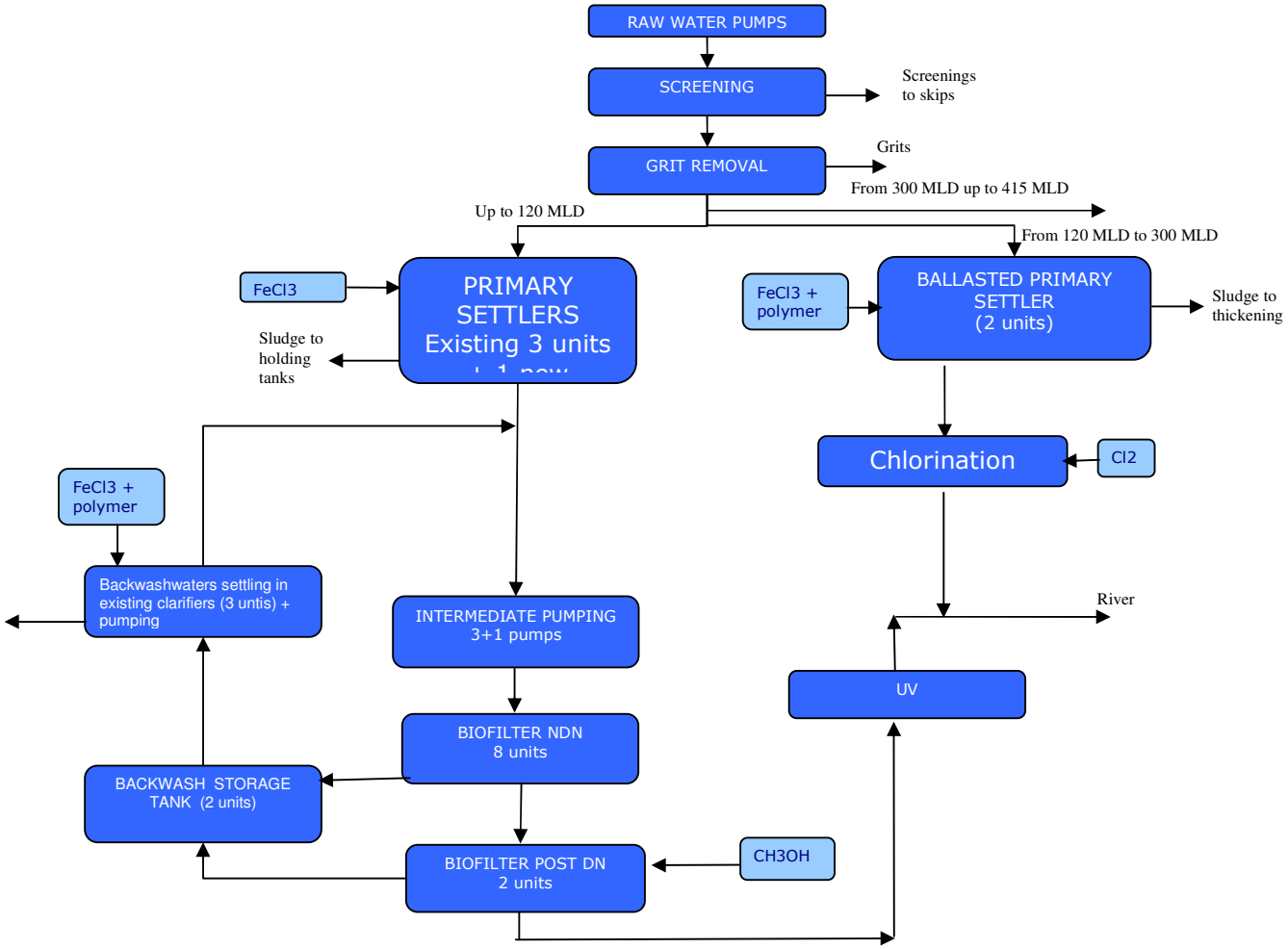
Stage 10: Stabilization

- ☞ Stabilization of biomass and process optimization

6. OPTION 4 : BAF

6.1. Process

- Headworks
  - Raw water pumps
  - Fine screens (6 mm punched-holes)
  - Grit removal
- Biofiltration line (120 MLD)
  - 3 existing Primary clarifiers + 1 new (coagulant will be added to all four clarifiers)
  - 1 new set of eight cells, NDN biofilter
  - 1 new set of two cells, post-DN biofilter
  - 1 new backwash storage tank
  - 3 existing secondary clarifiers for clarification of the backwash water;
  - UV treatment
- Excess Flows line
  - Ballasted Primary clarification (2 units)
  - Chemical disinfection
- Description of sludge treatment
  - Thickening of Ballasted Primary Settler sludge
  - Storage tanks
  - Truck loading facilities


RAW WATER PUMPS
SCREENING
Screenings to skips
GRIT REMOVAL
Grits
From 300 MLD up to 415 MLD
Up to 120 MLD
From 120 MLD to 300 MLD
FeCl3
PRIMARY SETTLERS Existing 3 units
Sludge to holding tanks
FeCl3 + polymer
BALLASTED PRIMARY SETTLER (2 units)
Sludge to thickening
Chlorination
Cl2
FeCl3 + polymer
Backwashwaters settling in existing clarifiers (3 untis) + pumping
INTERMEDIATE PUMPING 3+1 pumps
River
UV
BIOFILTER NDN 8 units
BACKWASH STORAGE TANK (2 units)
BIOFILTER POST DN 2 units
CH3OH

6.2. 5.2. Risks

- Delay of optimization of the reagents in CEPT

6.3. 5.3. Duration

- About 3 - 4 months

6.4. Phasage

Stage 0: Precondition

- Test of the bypass for > 300,000 m3/d => closing of the penstocks for the ballasted primary clarifiers (CSO) and the primary clarifiers.
- Test of the bypass
- Hydraulic tests by diverting the treated water to fill in the works and test the hydraulic connexions.
- Filling in of the CEPT #4 (new)
- High test of the blades of spillways

Stage 1: Commissioning primary clarifiers – Commissioning for backwash water pumping plant

- Kickoff of the 4th (new) primary clarifier
- Clarified water must have a TSS concentration lower than 100mg/l in order to go into BAF
- For the next stage, the start up of BAF, a clarifier will have to be used for the new station to treat the backwash water. The clarifier will have to be chosen in order to send the clarified water upstream the BAF units.
- The 2 other clarifiers will be kept for the running of the existing plant.
- The pumping plant for backwash water will have to be operational with the possibility of using only one clarifier first and the a 2nd, a 3rd, …

Stage 2: Commissioning NDN-BAF and PDN-BAF – BAF sowing

- Envisage the possibility of feeding BAF and existing biological basins at the same time. Progressively the primary effluent for BAF will be increased to insure an optimum sowing of the 8 NDN-BAF and the flow of primary effluent to existing biological basins will be diminished.

~ 3 weeks
- ~25%[2] of the flow to NDN-BAF
- ~75% to existing biological basins

~ 3 weeks
- ~50% of the flow to NDN-BAF
- ~50% to existing biological basins

Use of 1 clarifier for the backwash of BAF
2 existing clarifiers for the existing plant
Commissioning of 2 PDN-BAF : 50% of the NDN-BAF effluent (depending on the loads)

~ 2 weeks
- 75% of the flow to NDN-BAF
- 25% of the flow into existing biological basins

Use of 2 clarifiers for the backwash water of the BAF units
Only 1 clarifier for the existing plant
Sowing of PDN-BAF : 50% of the downstream flow from NDN-BAF (depending on loads)

~ 2 weeks
- 100% of the flow to NDN-BAF
- 0% of the flow into existing biological basins

Sowing of PDN-BAF : 50% of the downstream flow from NDN-BAF (depending on loads)

[2] Pourcentage donné à titre indicatif. Chiffre réel lors de la MER avec mesures de la charge réelle

Stage 3: rehabilitation works for the chlorination basins

- Stop existing biological basins. Emptying, cleaning out, cleaning.
- Rehabilitation works of the existing biological basins to create the chlorination basins.

Stage 4: Commissioning of ballasted primary clarifiers

- Test of the bypass for> 120 000 m3/d => closing penstocks of the primary clarifiers
    - Supply of the reagents for ballasted primary clarifiers
    - Supply chlorine and security in the chlorination area
- Kickoff of the 2 CSO ballasted primary clarifiers by splitting the flow :
    a. start ballasted primary clarifiers with 50 % of the nominal flow
    b. test with 100 %
    c. start up ballasted primary clarifiers and chlorination by splitting the flow between the existing plant and the ballasted primary clarifiers for a test during 1 week.

Stage 5: Commissioning of UV desinfection

- Start up of the UV. Possible from middle of stage 8 according to the quality of effluent.

Stage 6: Stabilization

- Stabilization of biomass and process optimization

7. CONCLUSION

Hydraulic management	
Option 2	**7**
Option 3	**6**
Option 4	**9**

Phasage easiness	
Option 2	**8**
Option 3	**7**
Option 4	**9**

Connexion existing/new plants	
Option 2	**7**
Option 3	**6**
Option 4	**9**

Com duration	
Option 2	**8**
Option 3	**7**
Option 4	**9**

Delay risk	
Option 2	**8**
Option 3	**6**
Option 4	**9**

Scores from 0 to 10

☞ Option 4 is the easiest to commission. It has less hydraulic risk, and less risk in respect to delay. Options 2 and 3 are longer to commission and include hydraulic risks. The option 3 could generate delays due to the double biological system in place (AS and BAF).

☞ The duration for M&E commissioning is shorter for option 4: there is less swing existing / new electrical panels and existing / new control system.

☞ The emptying of the basins of the existing plant is made easier in options 2 and 3.

☞ For options 2 and 3, ballasted primary clarifiers will be considered as an alternative for the main stream. Consequently, the treatment will be limited to settlement. For option 4, the existing plant will be considered to the alternative => The quality of effluent thus will be the same than currently.

☞ For option 4, rehabilitation works of the existing biological basins are not embarrassing for the phasage of the main stream commissioning. These works can be accomplished before or after the start up. For options 2 and 3, these works are required to to accomplish the commissioning of the main stream, generating delay.

☞ The M&E start up will be shorter in option 4 because the use of existing basins is not as important than for options 2 and 3.

Period of Commissioning

For all the options, it is preferable to plan the commissioning during summer / autumn, when the influent is the less cold and thus will facilitate the microbiological growth.