SECTION 3.0
FIRST PRIORITY CONTROL ALTERNATIVES

3.1 ALTERNATIVES CONSIDERED

As noted in Section 1.0, an objective of the Conceptual Design phase of the Nitrification Study was to evaluate a number of alternatives for control of the ammonia content in the effluent from the City of Winnipeg's three Water Pollution Control Centres (WPCCs). There is a wide range of approaches to ammonia control that could be considered by the City, resulting in a wide range of levels of effluent ammonia control. The level of control that would ultimately be required for each WPCC must be selected in concert with the findings of the Ammonia Study, in which the benefits of the various levels of control are being considered.

Therefore, so as to undertake the conceptual design of only the levels of control that would have some likelihood of providing benefits consistent with the requirements of the rivers, the Nitrification Study proceeded in parallel with the Ammonia Study. The exchange of findings as the two studies progressed allowed the City to select in a step by step manner the levels of control to be examined.

As a first priority, it was decided to examine one level of control at each end of the wide spectrum of possible levels of control. At the upper end of the spectrum, the application of "Best Practicable" technology was deemed to provide a realistic indication of the maximum level of control that was available to the City given the current state of wastewater treatment technology and practicality of implementation. At the lower end of the spectrum, optimization of the existing plants with minimal capital expenditure was deemed to provide a level of control one step above the current situation wherein no enhanced ammonia control is provided. In addition to these two scenarios, it was recognized that the centrate generated by the biosolids handling facilities at the North End Water Pollution Control Centre (NEWPCC) contributes a significant ammonia load to the NEWPCC secondary processes. Thus, it was deemed that the examination of control of the ammonia in this source had the potential to provide some level of control, possibly at a very reasonable cost.

In addition, for the foregoing first priority control alternatives, it was decided to examine only the dry weather flow conditions. Wet weather flows were not considered at this stage.

The first priority levels of control are summarized below and the conceptual designs of these alternatives are documented in detail in Sections 4.0, 5.0, and 6.0.

Best Practicable Level of Control

The Best Practicable Level of Control is based on the application of the most up to date proven technology for nitrification in wastewater treatment plants. Plant upgrades based on best practicable technology comprise of major additions to the physical plant to provide the needed capacity to effect the nitrification process in an optimum manner. Based on the application of such technology in other jurisdictions, it is realistic to conclude that an effluent ammonia concentration of 2 mg/L would be achievable during the summer on a reliable basis. To achieve this degree of ammonia reduction, normally the best practicable technology will result in expenditures at the high end of the anticipated spectrum of costs.

Optimization of the Existing Plants

All three of the City's WPCCs utilize an activated sludge biological treatment process that provides a small degree of ammonia reduction. It may be possible to enhance the degree of ammonia reduction occurring in the existing plants through minimal modifications and expenditure, resulting in a so called least cost approach. This approach is aimed at optimizing the nitrification performance at each of the existing plants with the least expenditure. The degree of ammonia reduction available through optimization of the existing plants will be dependent on the physical limitations at each specific plant. Therefore, this approach results in alternatives at the opposite end of the spectrum from that of the Best Practicable Level of Control in terms of both cost and degree of ammonia reduction.

NEWPCC Centrate Side Stream Treatment

The biosolids from the South End Water Pollution Control Centre (SEWPCC) and the West End Water Pollution Control Centre (WEWPCC) are transported to the NEWPCC where all of the biosolids generated at the three plants are stabilized and dewatered, prior to final disposal under the WinGro program. The NEWPCC employs a centrifuge facility to dewater the digested biosolids. The process generates a liquid side stream that is high in ammonia content. The side stream is returned to the front of the plant for treatment. Removal of the ammonia from the side stream prior to return to the front of the plant will reduce the ammonia loading on the plant resulting in a lower ammonia concentration in the effluent. This represents a means to achieve some level of ammonia reduction at possibly a reasonable cost.

3.2 EFFLUENT TARGETS

In the Ammonia Study, it was determined that the critical time of the year to meet ammonia criteria in the rivers is generally the month of August, due to the lower river flows and higher pH conditions in the river during this month. Therefore, for the Best

Practicable Level of Control, the conceptual designs have been based on achieving an effluent ammonia concentration of 2 mg/L in the month of August.

During other times of the year, the critical ammonia concentration in the rivers will be less stringent. The extreme condition is the spring season, which could occur in March, April or May depending on the timing of the snowmelt. In the spring season, the ammonia concentration discharged from the WPCCs can be allowed to increase because the increased flow in the rivers provides more dilution of the ammonia, reducing it to a lower concentration. In addition, the pH of the rivers is generally lower, decreasing the portion of un-ionized ammonia.

In order to determine the acceptable increase in ammonia concentration during the spring season, the Ammonia Study team completed an assessment using a hypothetical discharge from the NEWPCC into the Red River. By assessing river flow and pH, an allowable ratio of spring to summer effluent concentrations was estimated to be about three. The ratio of 3 mg/L allowed in spring for every 1 mg/L allowed in August was used as a guideline in developing the allowable seasonal variation in effluent ammonia concentrations for the various scenarios.

These ranges should be considered general targets.