

## IV.1 Water Quality and Bacterial Contamination

The initial problems (pre 1990) with water quality and bacterial contamination in Hamilton Harbour included: too much algae, anoxic bottom water, bacterial contamination from combined sewer overflows, surface runoff and illegal hookups, turbidity caused by algae and land erosion, and high phosphorous and ammonia levels. The RAP uses the term “water quality” to refer to clarity, oxygen, nutrient and bacteria levels. Toxic substances are dealt with in a separate component. Poor water clarity is caused by enhanced algal growth due to nutrient enrichment as well as by suspended solids influenced by runoff and effluent inputs, carp activity in shallow areas, and wave action. The enhanced algal growth also affects water quality by consuming dissolved oxygen in the water during decomposition. Bacterial contamination is to be expected to some degree in an urban watershed, but combined sewer overflows (CSOs) during wet weather events exacerbate the problem in Hamilton Harbour.

Results from 2001 monitoring show that ammonia levels still present dramatic variations, however it is clear that the Harbour provides an immediate response when loads decrease from the wastewater treatment plants. Total phosphorus levels are approaching the initial goal of 34 µg/L. Chlorophyll levels have been close to meeting the initial goal of 15 µg/L – 20 µg/L, but algal blooms caused peaks that exceed the goal. Water clarity readings are sometimes meeting the initial goal of 2.0 m Secchi depth. Bacteria levels greater than the provincial objective of 100 E. coli organisms/100 mL still cause the two swimming beaches in the Harbour to be closed for about half of the swimming season. Overall, the Harbour waters are about halfway to meeting the RAP goals, but another \$500-600 million is required for wastewater treatment infrastructure upgrades to reach them. Analysis of the effectiveness of actions will continue to be important to direct the progress of future implementation actions with the goal of achieving and sustaining the final water quality targets.

The Region of Halton’s Skyway Wastewater Treatment Plant (WWTP), the existing system recently enhanced through a process optimization, is already meeting the initial effluent loading targets for ammonia, phosphorous and suspended solids. Eventually the planned expansion of the plant will result in loadings progressing to levels more than the target. The City of Hamilton has planned for various upgrades and optimization projects at their three WWTPs, which are anticipated to provide effluents that meet the initial loadings targets by 2003. The combined sewer overflow (CSO) upgrades are scheduled over the next twenty years. The City of Hamilton is developing a Wastewater Investments Needs & Strategies (WINS) plan that will outline works needed, timelines, and methods of funding. Both the Region of Halton and the City of Hamilton have reported on proposed measures to find alternatives to reduce the effect of chlorine toxicity in effluent from the WWTPs.

The principal limiting factor in the restoration of the Cootes Paradise Marsh is water quality. Once the planned improvements at the King St (Dundas) WWTP and the CSO program in that area occur there will be a better understanding as to whether restoration targets for the Cootes Paradise Marsh can be achieved and sustained.

A toxic blue-green algae bloom observed in Hamilton Harbour in late August of 2001 resulted in municipal Public Health departments posting beach closures to protect people and pets. This underscores the importance of reducing nutrient inputs to limit future algal growth.

Although toxic substances are dealt with under a separate component, they are addressed in this component indirectly. When actions are taken to remove phosphorus from wastewater effluents, additional suspended solids are also removed and the loading of toxic substances to the Harbour is also decreased, because many toxic substances are tied to the suspended solids particles.

Emerging issues in water quality and bacterial contamination include:

- population growth requiring more wastewater treatment,
- toxic blue-green algae becoming more common,
- filamentous algal blooms smothering vegetation in Cootes Paradise,
- potential for endocrine disrupting compounds and pharmaceuticals to appear in treated WWTP effluent, and
- determining the cause of Harbour beach closures.

### IV.1.1 Key Water Quality Goals

#### Recommendation No. WQ – 1a

(1992 Rec. 1)

*It is recommended that the RAP adopt the environmental conditions listed in Table WQ – 1a as key water quality goals for the Harbour in order to increase the fish habitat, improve benthic fauna diversity and amount, to reduce the toxicity of bottom sediments, and improve water clarity.*

#### Responsible Agencies

All Agencies

#### Short Term Target

WQ – 1a.1 (2003) Initial targets as listed in Table WQ – 1a are to be met by 2003.

#### Long Term Target

WQ – 1a.2 (2015) Final targets as listed in Table WQ – 1a are to be met by 2015. Subject to a full assessment by BARC and BAIT of the utility and cost of measures required to reach these final targets.

Table WQ – 1a Water Quality Goals for Hamilton Harbour

	Harbour Initial Goal	Harbour Final Goal	Cootes Paradise	Grindstone Creek Area	Beaches
Phosphorus concentration ( $\mu\text{g/L}$ )	34	17	60-70	60-70	
Un-ionized Ammonia conc. ( $\text{mg/L}$ )	<0.02	<0.02	<0.02	<0.02	
Chlorophyll a conc. ( $\mu\text{g/L}$ )	15-20	5-10	20	20	
Secchi Disk Trans. (m)	2	3	1.5	1	1.2
Min. DO conc. (ppm)	>1	>4	>5	>5	
Submergent/ emergent aquatic plant area (ha)	105	170	240	50	
Suspended Solids (ppm)			25	25	
Bacteria (E. coli organisms/ 100 mL water)					<100

### Status

The Water Quality Task Group examined and revised the key water quality goals for Hamilton Harbour set out in the delisting criteria in the 1992 Stage 2 Report. These updated goals are presented in Table WQ – 1a. They are the environmental conditions that should be achievable if the loading targets (see Recommendation WQ – 1b) are met. The conditions are monitored in the Harbour and Cootes Paradise by researchers at Environment Canada (EC), Fisheries and Oceans Canada (DFO), Ontario Ministry of Environment (OMOE), the Royal Botanical Gardens (RBG), McMaster University, and the City of Hamilton.

In Table WQ – 1a, there are no suspended solids targets given for the Harbour because Secchi disk transparency services this function in that location. The initial goal for phosphorus concentration is greater than the provincial water quality interim objective of  $20 \mu\text{g/L}$ , which is set to avoid nuisance algae in lakes.

The environmental conditions are all likely attainable, with the exception of the final goal for oxygen of greater than 4 ppm in the hypolimnion, which is the bottom cold water layer in summer. There are questions as to whether Hamilton Harbour ever had greater than 4 ppm of dissolved oxygen in the hypolimnion, even though it sustained a commercial fishery for many years in the 19<sup>th</sup> Century. Whether the oxygen goal is attained or not, any movement toward it is an improvement, because it will increase the number of days during the summer season when there is enough oxygen for fish. Generally, fish need about 4 ppm of oxygen to survive whereas the bottom waters of the Harbour below 7 metres contain near zero oxygen for about three summer months each year.

The results from a 1970's Organization for Economic Co-operation and Development (OECD) study of eutrophication (enrichment of water with nutrients) were used to compare Hamilton Harbour water quality goals with other lakes (Figure 8) (Charlton, 2000, unpublished). The final water quality goals for Hamilton Harbour would rank between mesotrophic and eutrophic conditions, which is consistent with fairly mediocre water quality. Even so, achievement of the goals in Hamilton Harbour would be satisfying and a worthwhile improvement from starting conditions.

Figure 8. OECD Study of Eutrophication compared to Hamilton Harbour Goals

Variable		Oligotrophic	Mesotrophic	Eutrophic	HH RAP Goals
<b>Total Phosphorus</b> (µg/L)	Mean	8	27	84	34 Initial
	Range	3-18	11-96	16-386	17 Final
<b>Chlorophyll annual</b> (µg/L)	Mean	1.7	4.7	14.3	15-20 Initial
	Range	0.3-4.5	3-11	2.7-78	5-10 Final
<b>Chlorophyll max</b> (µg/L)	Mean	4.2	16.1	42.6	15-20 Initial
	Range	1.3-10.6	4.9-49.5	9.5-275	5-10 Final
<b>Secchi Depth</b> (m)	Mean	9.9	4.2	2.5	2 Initial
	Range	5.4-28.3	1.5-8.1	0.8-7	3 Final

Decreasing Aesthetic Value  $\longrightarrow$

Source: M. Charlton, EC

## IV.1.2 Net Loading Effluent Targets

### Recommendation No. WQ – 1b

(1992 Rec. 1)

*The net discharge of ammonia, phosphorus and suspended solids at all wastewater treatment plants and industrial facilities in the Harbour and its watershed meet the loading targets specified in Table WQ – 1b. Initial phosphorus targets and initial ammonia targets are to be met at WWTPs by the end of 2003. These targets are not to be exceeded thereafter, notwithstanding population growth.*

### Responsible Agencies

City of Hamilton, Regional Municipality of Halton, Dofasco, Stelco

### Short Term Target

WQ – 1b.1 (2003) Initial targets as listed in Table WQ – 1b are to be met by 2003.

**Long Term Target**

WQ – 1b.2 (2015) Final targets as listed in Table WQ – 1b are to be met by 2015. Subject to a full assessment by BARC and BAIT of the utility and cost of measures required to reach these final targets.

Table WQ – 1b: Net Loading Targets In Kilograms Per Day

	Phosphorus		Ammonia		Suspended Solids	
	Initial	Final	Initial	Final	Initial	Final
<b>Woodward WWTP</b>	140	60	2270	530	3750	900
<b>Skyway WWTP</b>	30	12	470	115	500	200
<b>Dundas WWTP</b>	5		22		28	
<b>Waterdown WWTP</b>	1		5		5	
<b>CSOs</b>	70	5	160	20	1400	200
<b>Streams</b>	90	65				
<b>Industry (combined)</b>			400	270		
<b>Stelco</b>					4000	1500
<b>Dofasco</b>					3500	1500
<b>Totals</b>	<b>336</b>	<b>142</b>	<b>3327</b>	<b>935</b>	<b>13183</b>	<b>4300</b>

**Status**

There are four wastewater treatment plants (WWTPs) discharging into Hamilton Harbour waters. Woodward Ave WWTP, King St (Dundas) WWTP, and Main St (Waterdown) WWTP are owned by the City of Hamilton and operated by a private contractor, with the Skyway WWTP owned and operated by the Region of Halton.

The RAP has set targets for net loadings from the WWTPs (Table WQ – 1b). Initial targets are to be met by 2003 and final target by 2015. However, the Water Quality Task Group recommends that the final loading targets be reviewed once the initial targets have been met and some analysis of corresponding conditions can be completed.

The City of Hamilton has embarked upon the development of a Wastewater Investments Needs & Strategies (WINS) process to lay the groundwork for long term capital plans for the improvement of Hamilton Harbour water quality by upgrading and expanding its WWTPs and CSO control facilities. This plan will include prioritization, costing, and a schedule of the works necessary to meet overall RAP water quality targets for WWTPs and CSOs. Recommendations for the development of a Hamilton Harbour Water Quality Strategic Plan were approved by Hamilton-Wentworth Regional Council in June 1999 and the plan, now called the Wastewater Investments Needs & Strategies (WINS) plan, is underway. The amalgamated City of Hamilton has contracted the Bay Area Restoration Council (BARC) to hold public meetings to present the plan to the public.

The City of Hamilton has already spent \$40 million on its wastewater treatment and containment system with another \$600 million slated (\$250 million for the CSO system and \$350 million for

the three wastewater treatment plants. The Woodward Ave WWTP needs to undergo upgrades in order to deal with population growth and the quality improvements necessary to meet RAP loading targets. These projects are expected to have a significant positive impact on the quality of the effluent and the loadings from the Woodward Ave WWTP. It is too early to tell if there has been a significant improvement provided by the primary clarifier expansion, completed in 2000. The new primary treatment capacity provides the future potential to treat greater volumes of wastewater during wet weather, which could significantly reduce plant bypasses and CSOs, and decrease overall costs to improve Hamilton Harbour water quality.

The King St (Dundas) and Main St (Waterdown) WWTPs already benefit from tertiary treatment, but still cannot consistently meet RAP loading targets. Optimization of these plants may eventually bring them close in the future. Projects at the King St (Dundas) WWTP include the elimination of a hydraulic bottleneck and wastewater diversion to Woodward WWTP to stabilize flow volumes. The Main St (Waterdown) WWTP is also scheduled to undergo a process optimization.

Halton Region has undertaken major improvements to the Skyway WWTP through a comprehensive optimization program and as a result, Halton reports initial RAP loading targets for phosphorus, total suspended solids, and ammonia are now being met. The plant is also being expanded in a two-phase project. Phase I was completed in 2001 and Phase II is scheduled for 2008.

It may be feasible for both the Skyway and Woodward WWTPs to attain initial loading targets without the aid and additional expense of tertiary treatment in the shorter term. However, as volumes increase due to added population and added impermeable surfaces in the watershed, effluent quality must continue to improve to meet or maintain even the initial loading targets.

Wastewater can be treated to one of three levels at the Woodward WWTP: no treatment (plant bypass), primary treatment (secondary bypass), or secondary treatment (no bypass). Currently flows are only measured as wastewater enters the Woodward Plant, missing any plant bypass. Concentrations are measured at the end of the secondary treatment; therefore, some of the loadings represented in the charts may be artificially low since the flow at the outfall will be lower during a bypass event. To get a better picture of the flows, concentrations, and loadings there are some projects scheduled for Woodward WWTP in 2002. The flows will be monitored at both of the bypass areas, along with monitoring of concentrations in those flows. This project will assist the RAP in deciphering the total loadings of phosphorus, ammonia, and suspended solids into Hamilton Harbour. Halton does not presently do any analysis on bypass occurrences at Skyway WWTP. Bypasses there are treated with sodium hypochlorite (NaOCl) as required by OMOE.

### IV.1.3 Combined Sewer Overflows

#### Recommendation No. WQ – 1c

(1992 Rec. 1)

*It is recommended that the requirements of OMOE Procedure F-5-5 for the Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer Systems be met, including:*

- i) *eliminating the occurrence of dry weather overflows;*
- ii) *minimizing the potential for impacts on human health and aquatic life resulting from CSO;*
- iii) *achieving as a minimum, compliance with body contact recreational provincial water quality objectives (PWQO) for E. coli at beaches impacted by CSO for at least 95% of the four month period (June 1 to Sept. 30) for an average year.*

*In addition to the control of all dry weather flow, 90% of the flow volume resulting from wet weather flow should be captured and treated during a seven month period commencing within 15 days of April 1.*

#### Responsible Agencies

City of Hamilton

#### Short Term Target

WQ – 1c.1 (2004) To implement remedial measures for Combined Sewer Overflows (CSOs) into Cootes Paradise Marsh.

WQ – 1c.2 (2004) To prepare implementation strategies for the remaining CSOs.

#### Long Term Target

WQ – 1c.3 (2015) To implement remedial measures for the remaining CSOs.

#### Ongoing Target

WQ – 1c.4 The Public Health Department to continue the beach monitoring program aspects of this recommendation.

#### Status

Part of the old City of Hamilton is serviced by a combined sewer system, which carries wastewater and stormwater in the same pipes. During wet weather conditions with the sudden increase in stormwater, the system may discharge untreated flows to the Harbour and Cootes Paradise. This is to prevent the hydraulic capacity of Woodward WWTP from being exceeded and to prevent backups into homes and businesses. Although necessary in the system, it is important to manage combined sewer overflows (CSOs) in order to protect the environments they discharge into.

The RAP net loading targets set for CSOs in kilograms per day (kg/day) are:

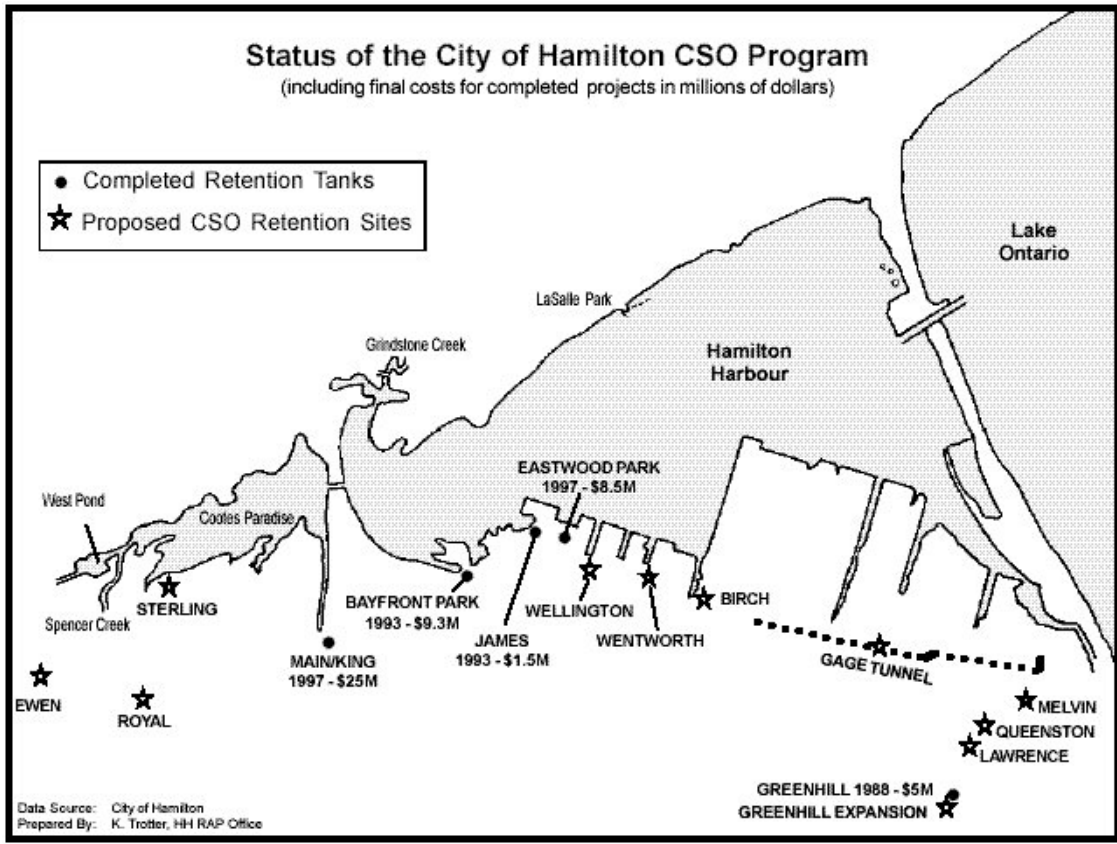
	<u>Initial</u> (2003)	<u>Final</u> (2015)
Phosphorus	70	5
Ammonia	160	20
Suspended Solids	1400	200

The Hamilton system is required to comply with OMOE Combined Sewer Overflow (CSO) Control Procedure F-5-5 for the determination of treatment requirements. The goals are to eliminate dry weather overflow occurrences and thereby minimize potential impacts from CSOs. The City began receiving funding to complete an “Investigation of Innovative Options for Wet Weather Treatment at the Woodward Avenue Wastewater Treatment Plant” in 2000. This is part of the larger effort to develop the overall WINS Plan. Both of these initiatives may alter the course of decisions for CSOs in the future if tanks and tunnels are not found to be the best options to pursue.

A CSO tank has been the solution used in four areas in the western part of the Harbour and Cootes Paradise (Chedoke Creek) for a total of 123,000 m<sup>3</sup> of storage. According to figures provided by the City of Hamilton, the estimated average annual CSO volumes have been reduced by approximately 78 %, or approximately 2.4 million m<sup>3</sup> during April to October in the area of the tanks. Overall CSO volume from the entire combined sewer system has been reduced by approximately 39 % and approximately 62 % of the stormwater entering the combined sewer system now receives treatment at the Woodward Avenue WWTP. The opportunity to provide treatment to stormwater is one benefit of a combined sewer system. Stormwater also carries bacteria and other pollutants, and typically discharges into local waterways.

A storage / treatment tank near Red Hill Creek on Green Hill Avenue, built in 1988, provides another 10,000 m<sup>3</sup> of storage. The City of Hamilton is currently constructing a second CSO storage tank at Green Hill Avenue to meet the requirements of OMOE Procedure F-5-5. An Environmental Assessment is almost complete for the three outfalls in Ward One, including Ewen, Royal, and Sterling. The preferred alternative for controlling the three remaining CSO outfalls on the Red Hill Creek (Lawrence, Queenston, Melvin) has been selected and designed. This is consistent with the priority expressed in the original RAP. Also budgeted for the period between 2002 and 2020 are projects for CSO containment at the remaining uncontrolled outfalls. The city is currently completing a review of the alternatives for meeting OMOE Procedure F-5-5, which will likely involve some combination of storage and satellite treatment facilities. Figure 9 is a map showing locations and status of the combined sewer overflow program in the City of Hamilton.

Figure 9. Status of the Combined Sewer Overflow Program in the City of Hamilton



Date: August 20, 2002

#### IV.1.4 Net Loading Trends

##### Recommendation No. WQ – 1d

(1992 Rec. 1)

*In order to track net loading trends, it is recommended that measurement of the loads (as identified in Table WQ – 1b) be made in accordance with OMOE regulations, Certificates of Approval and procedures, and that these data along with useful supplementary data generated by the WWTPs or industries be made public on an annual basis.*

##### Responsible Agencies

City of Hamilton, Regional Municipality of Halton, Dofasco, Stelco

##### Ongoing Target

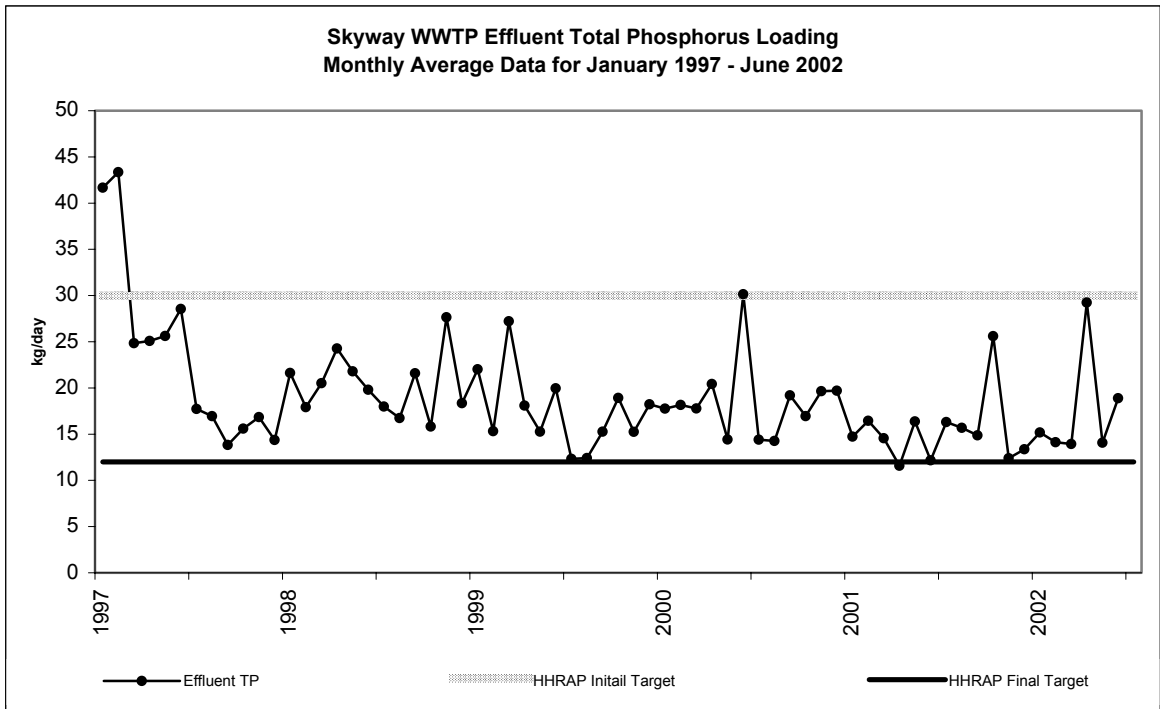
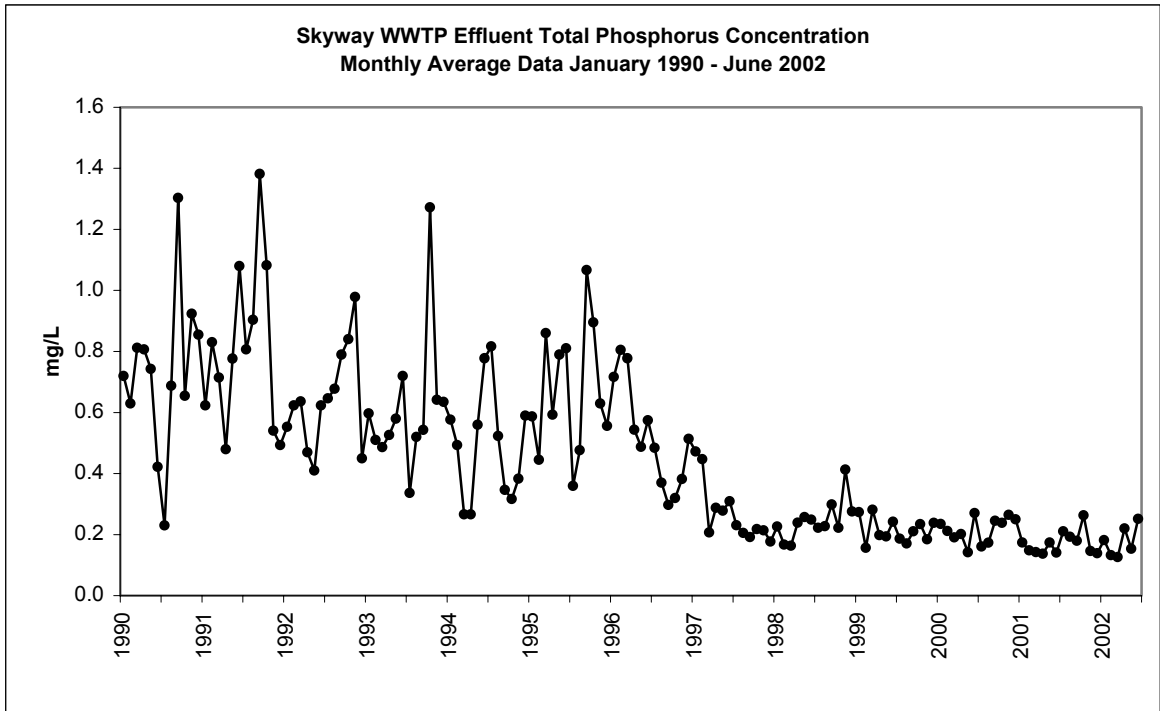
WQ – 1d.1 To report annually to BARC and the public.

**Status**

Data on the monthly averages of effluent total phosphorus, ammonia, and suspended solids for all four of the WWTPs in Hamilton Harbour in both concentrations and loadings are shown in Figures 10 – 21.

The net loading of ammonia and phosphorus from the Dofasco and Stelco effluent streams are presented in Figures 22 and 23. Other net loading data from the industries appear in the Toxic Substances and Sediment Remediation Component of this chapter (Section 3).

Figure 10. Skyway WWTP Effluent Total Phosphorus Concentrations and Loadings



Source: Region of Halton

Date: August 24, 2002

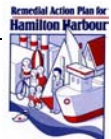
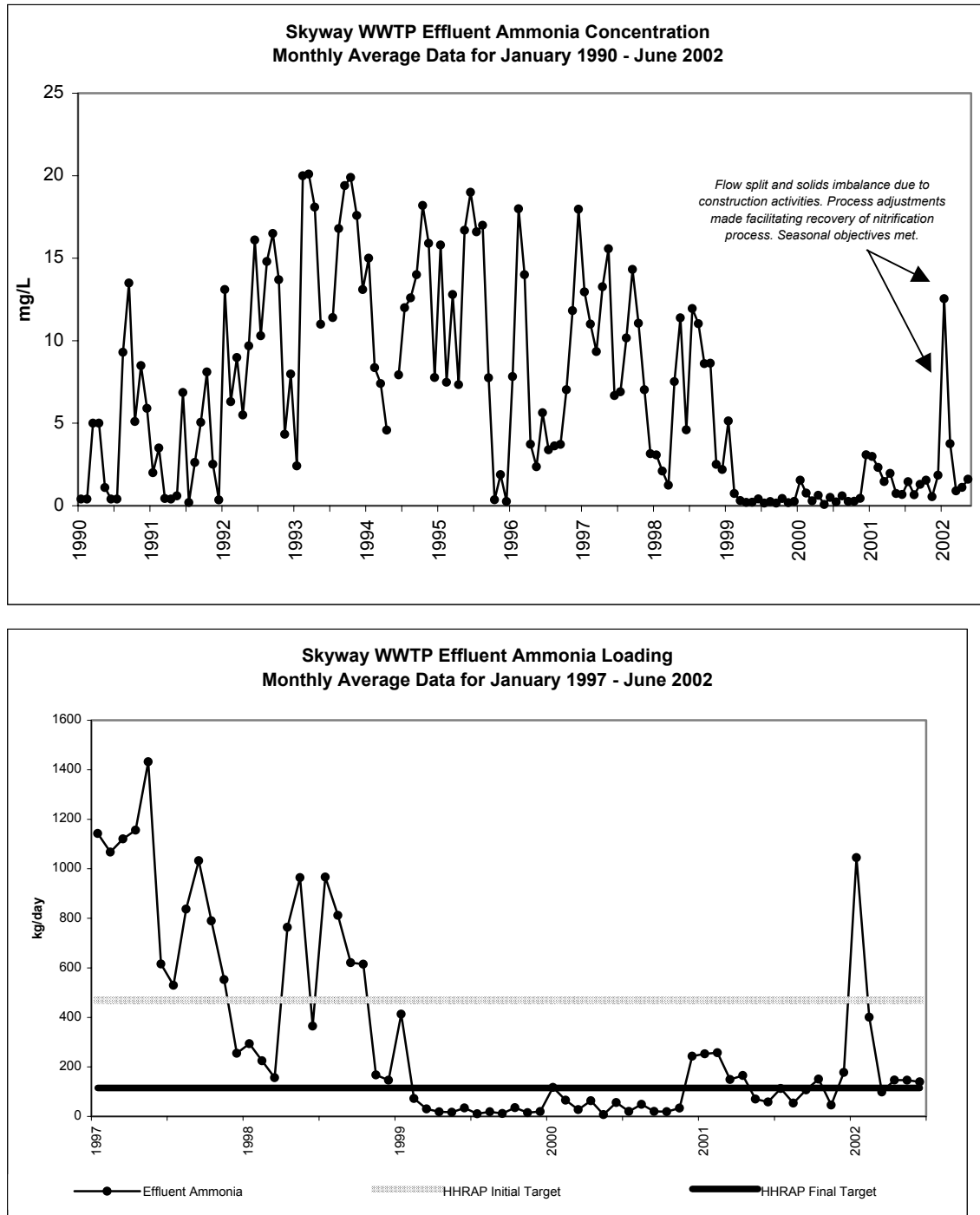


Figure 11. Skyway WWTP Effluent Ammonia Concentrations and Loadings



Source: Region of Halton

Date: August 24, 2002

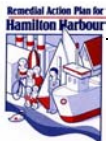




Figure 13. Woodward WWTP Effluent Total Phosphorus Concentrations and Loadings

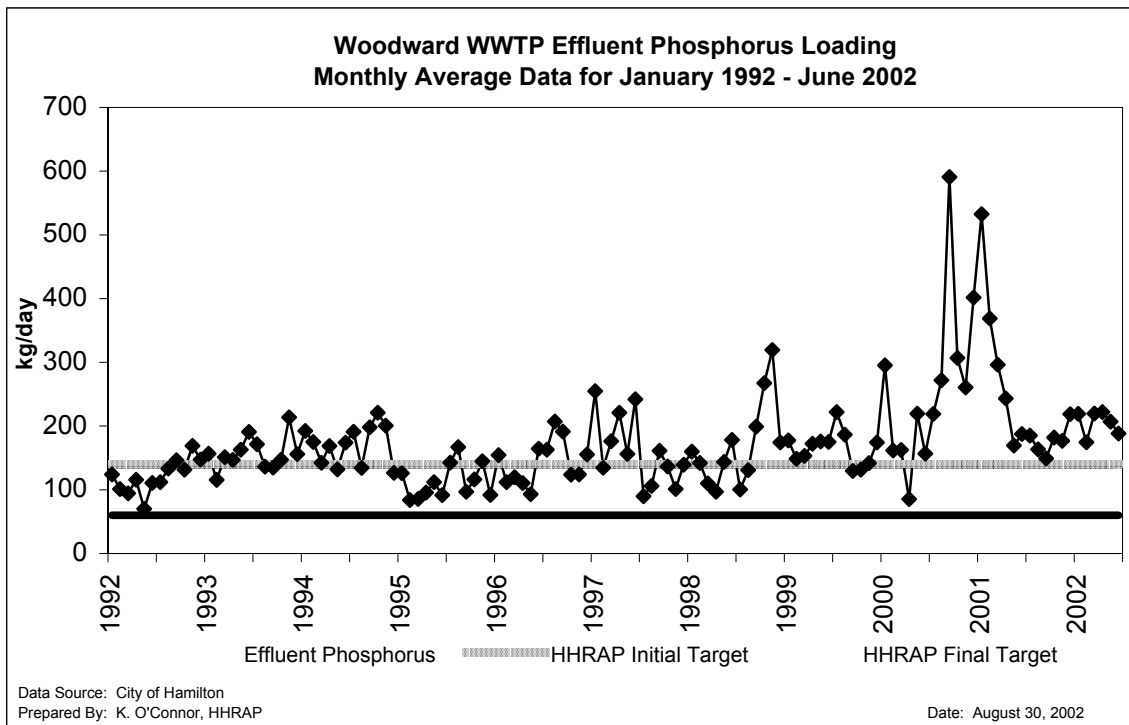
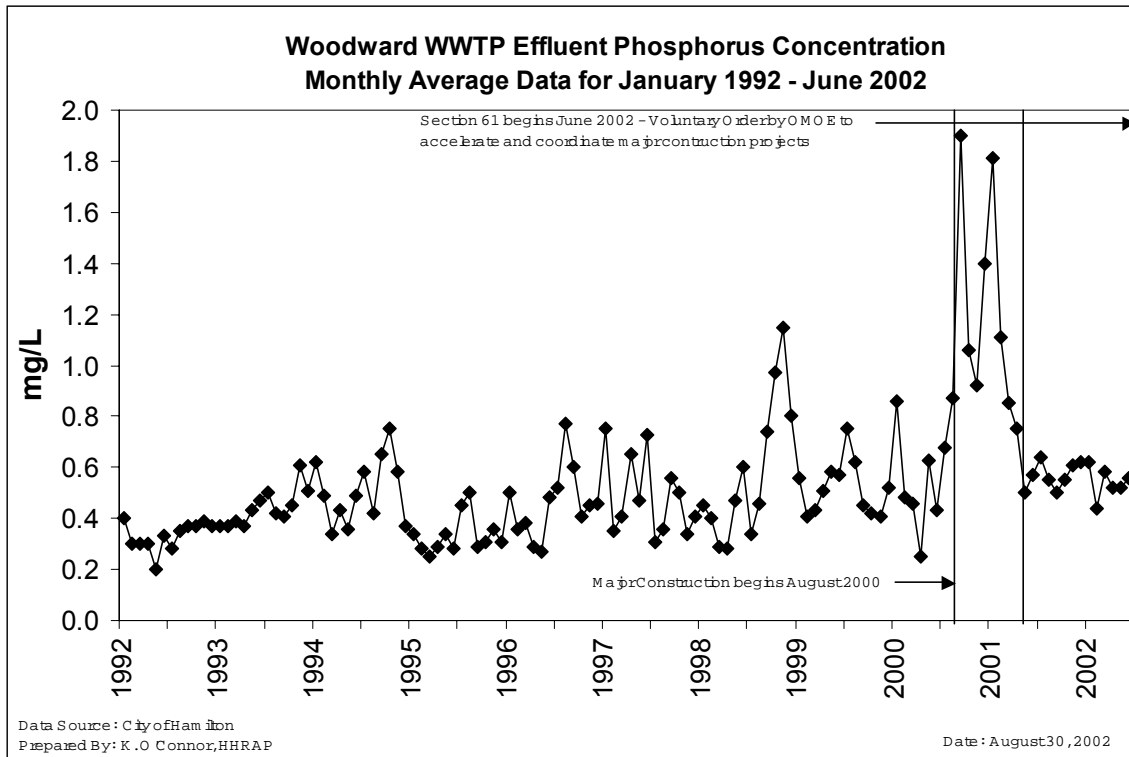


Figure 14. Woodward WWTP Effluent Ammonia Concentrations and Loadings

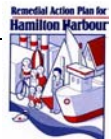
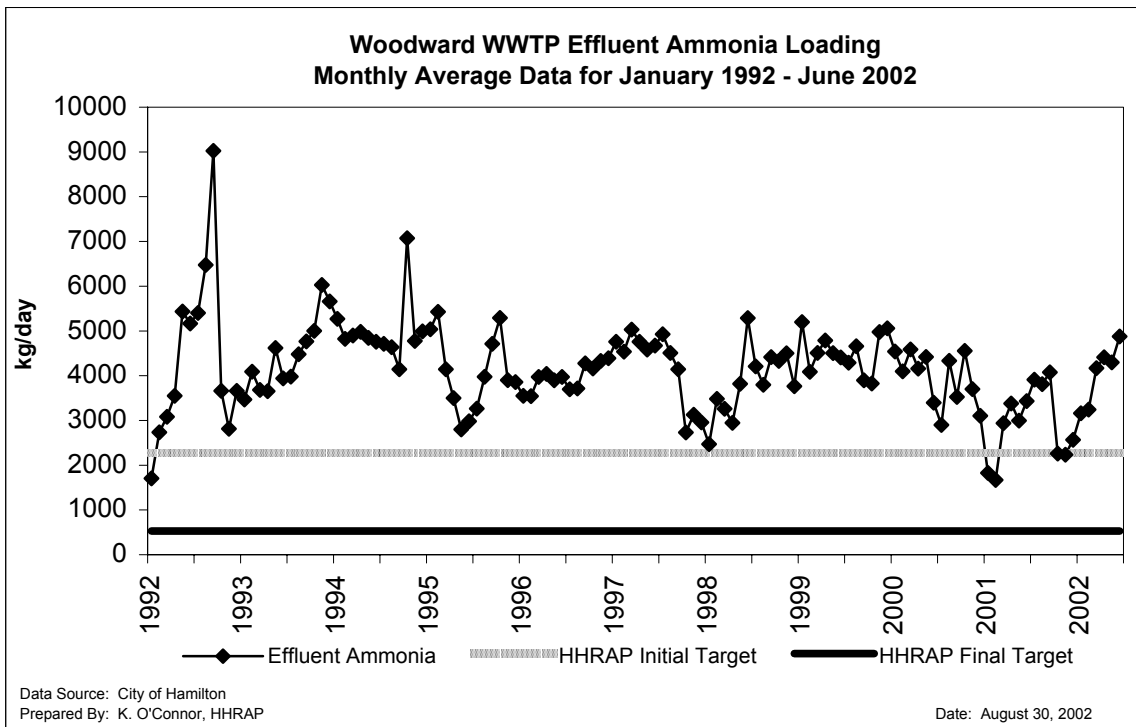
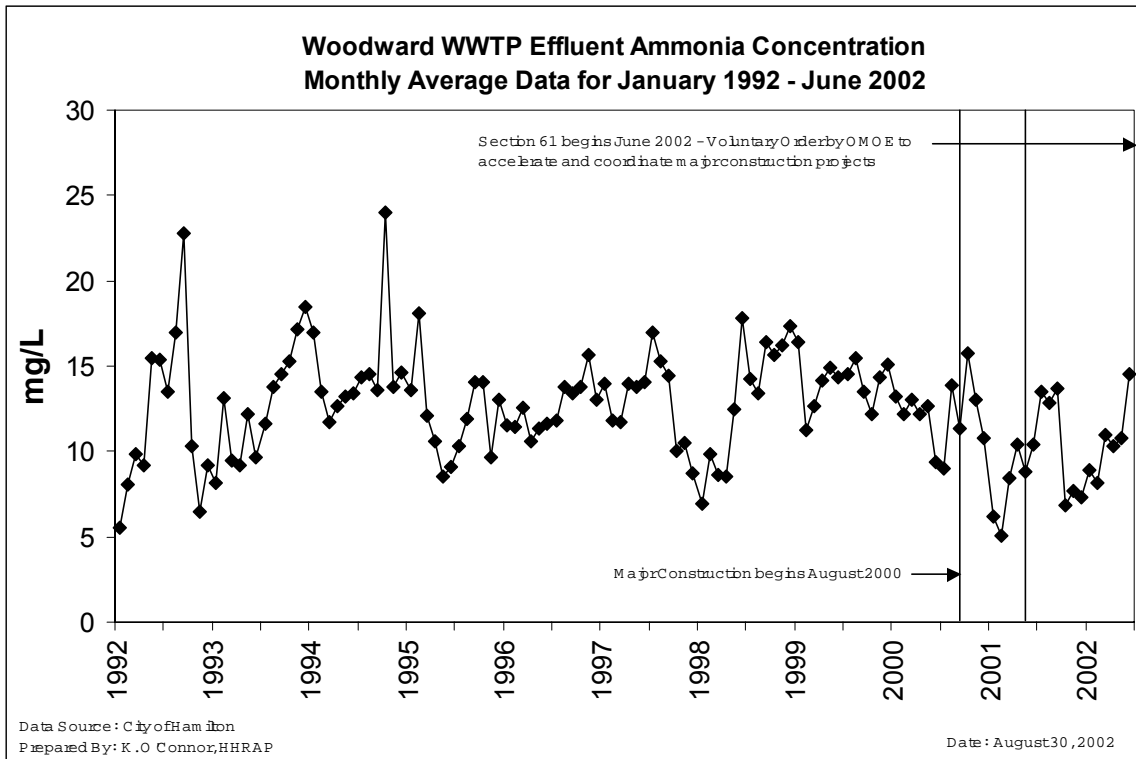


Figure 15. Woodward WWTP Effluent Suspended Solids Concentrations and Loadings

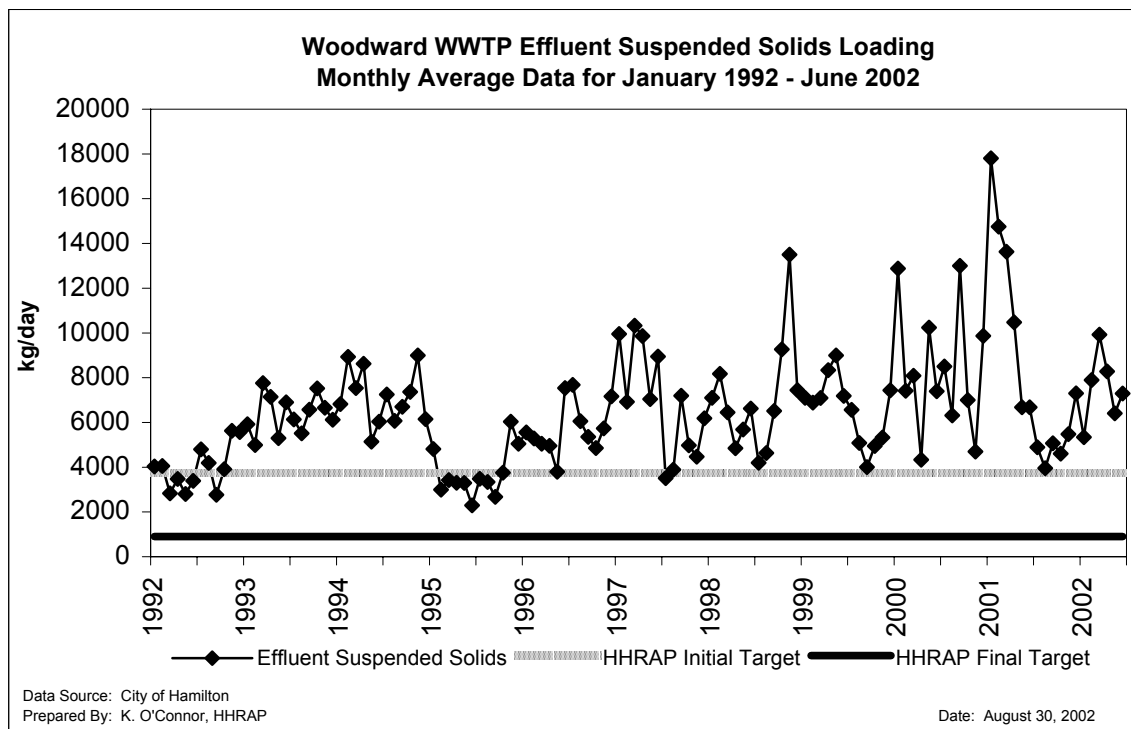
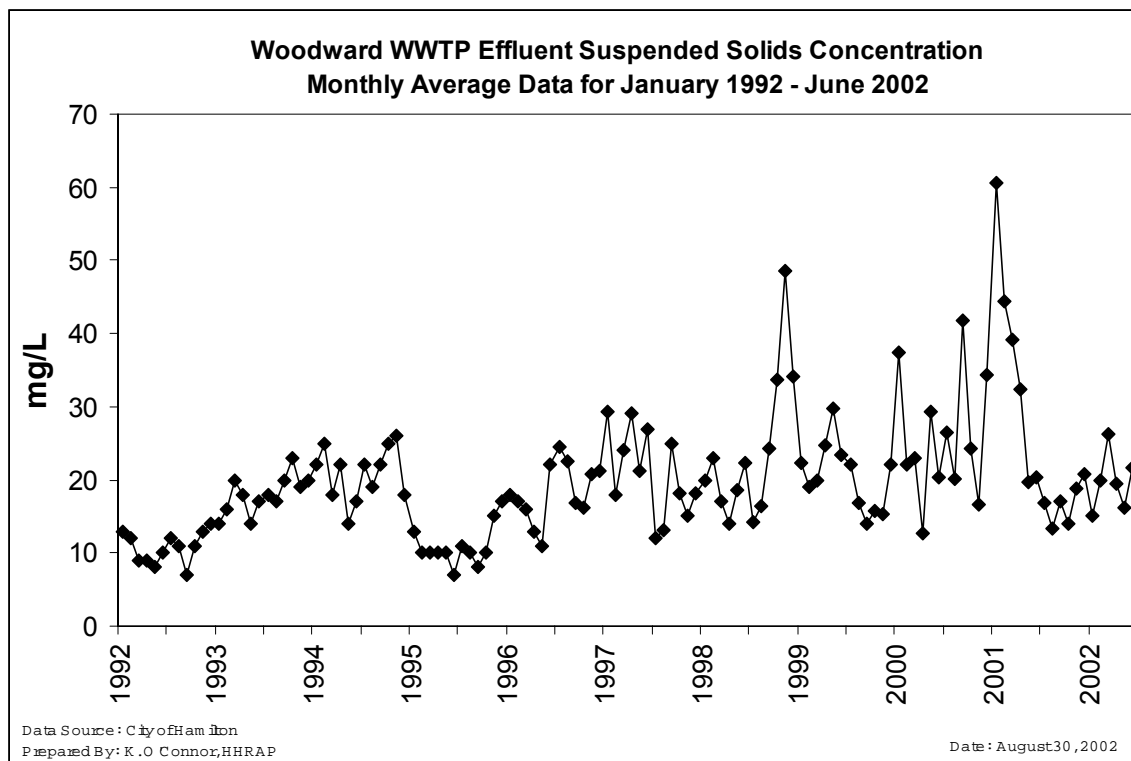


Figure 16. King St (Dundas) WWTP Effluent Total Phosphorus Concentrations and Loadings

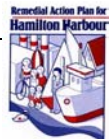
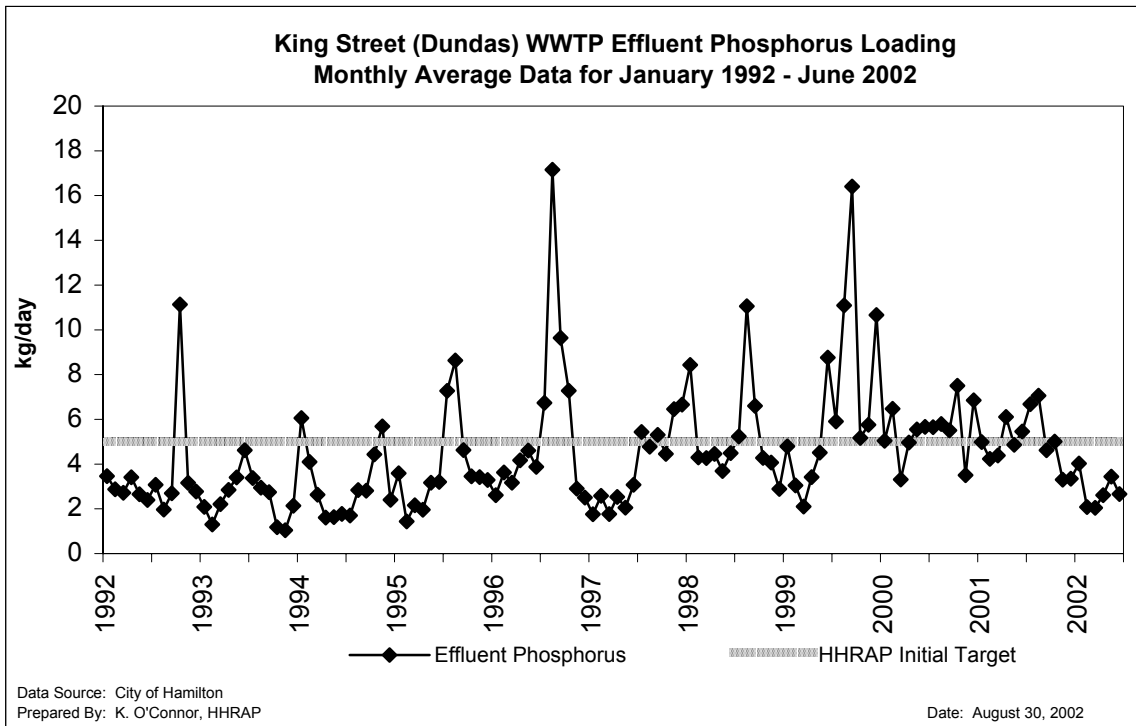
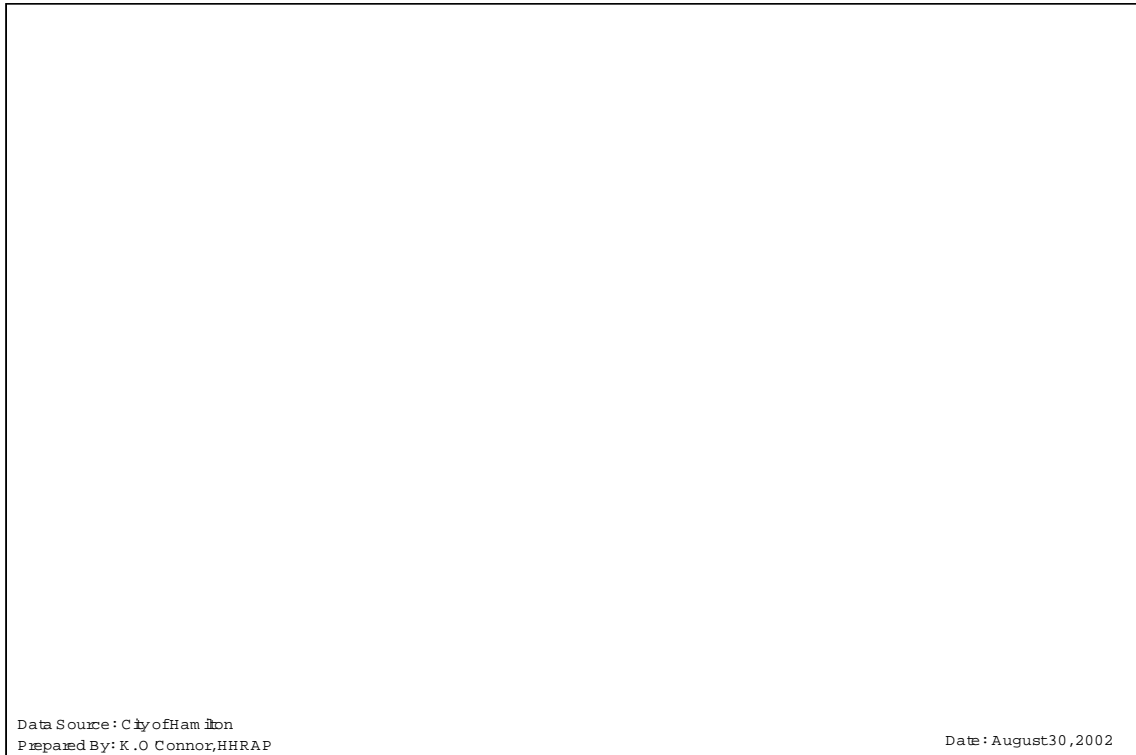


Figure 17. King St (Dundas) Effluent Ammonia Concentrations and Loadings

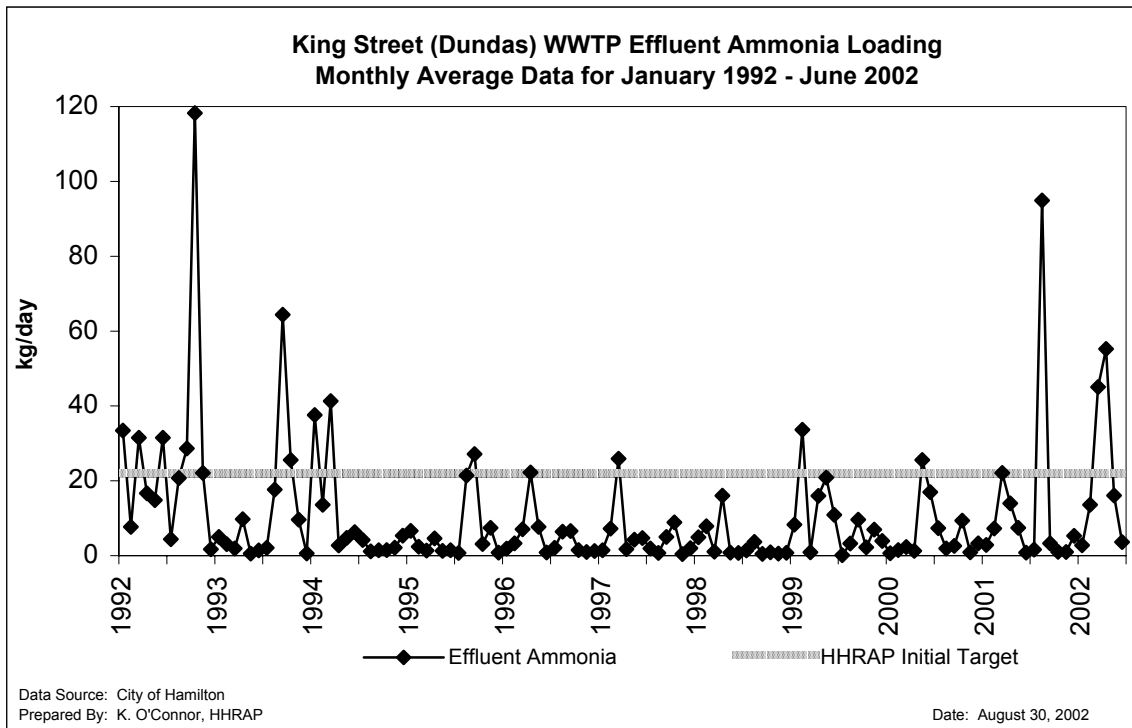
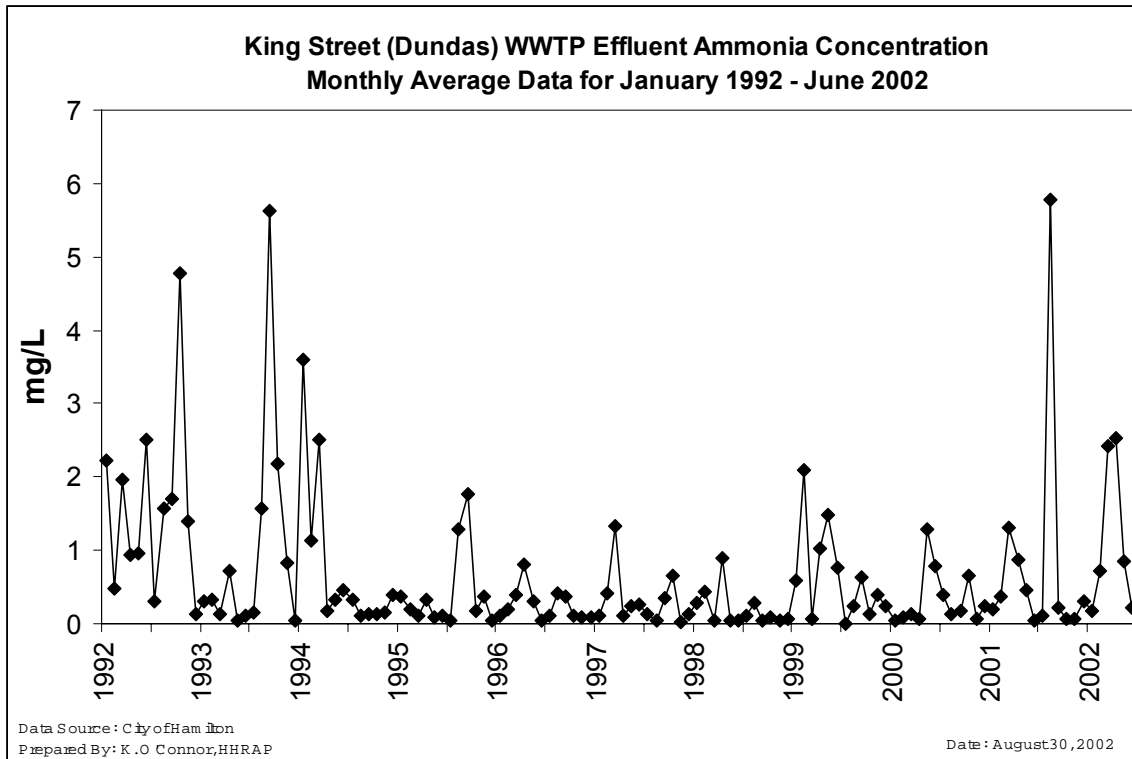


Figure 18. King St (Dundas) WWTP Effluent Suspended Solids Concentrations and Loadings

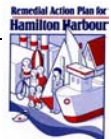
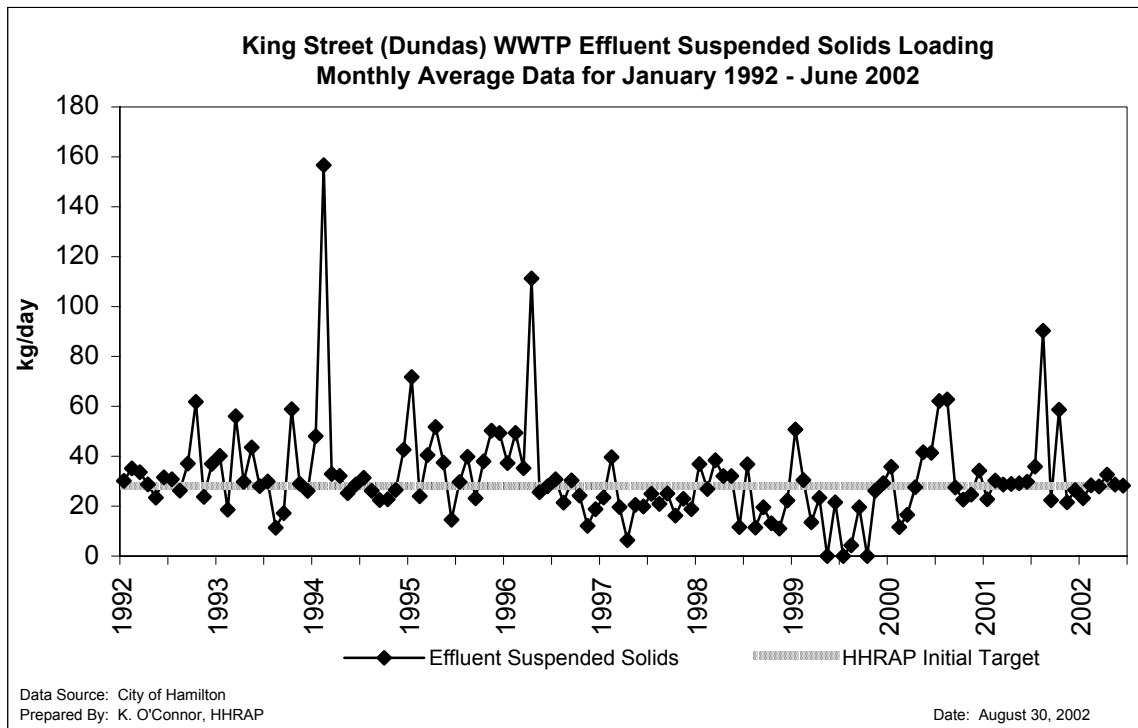
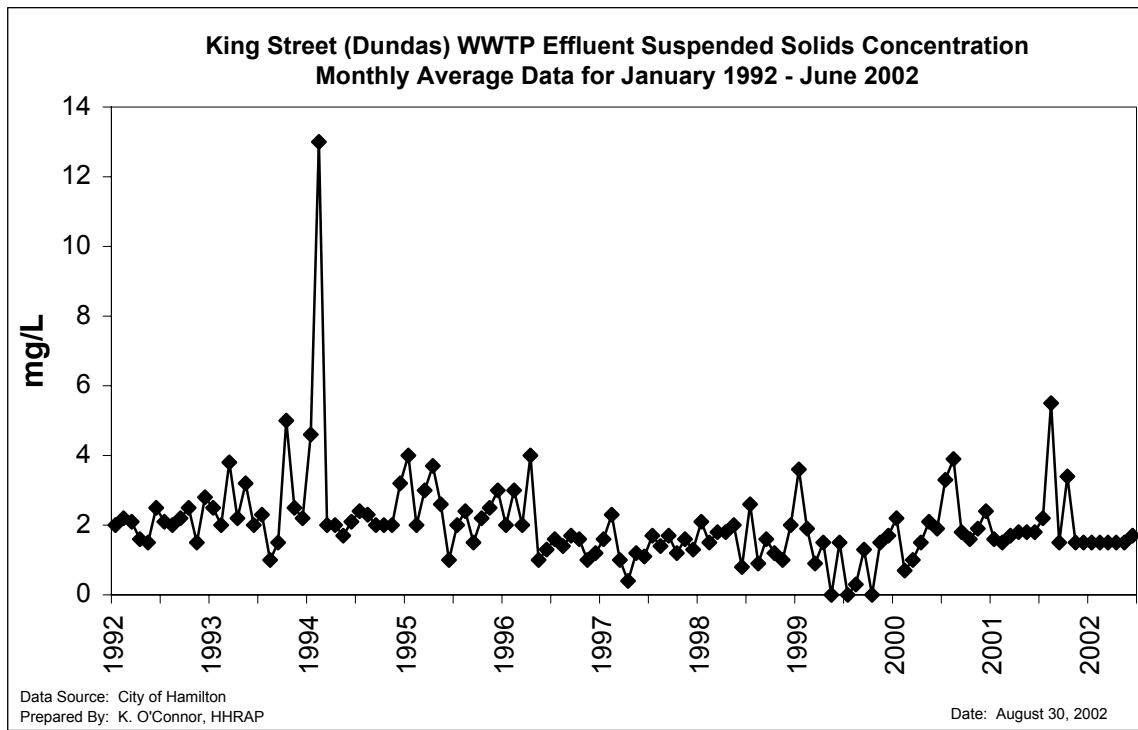


Figure 19. Main St (Waterdown) WWTP Effluent Total Phosphorus Concentrations and Loadings

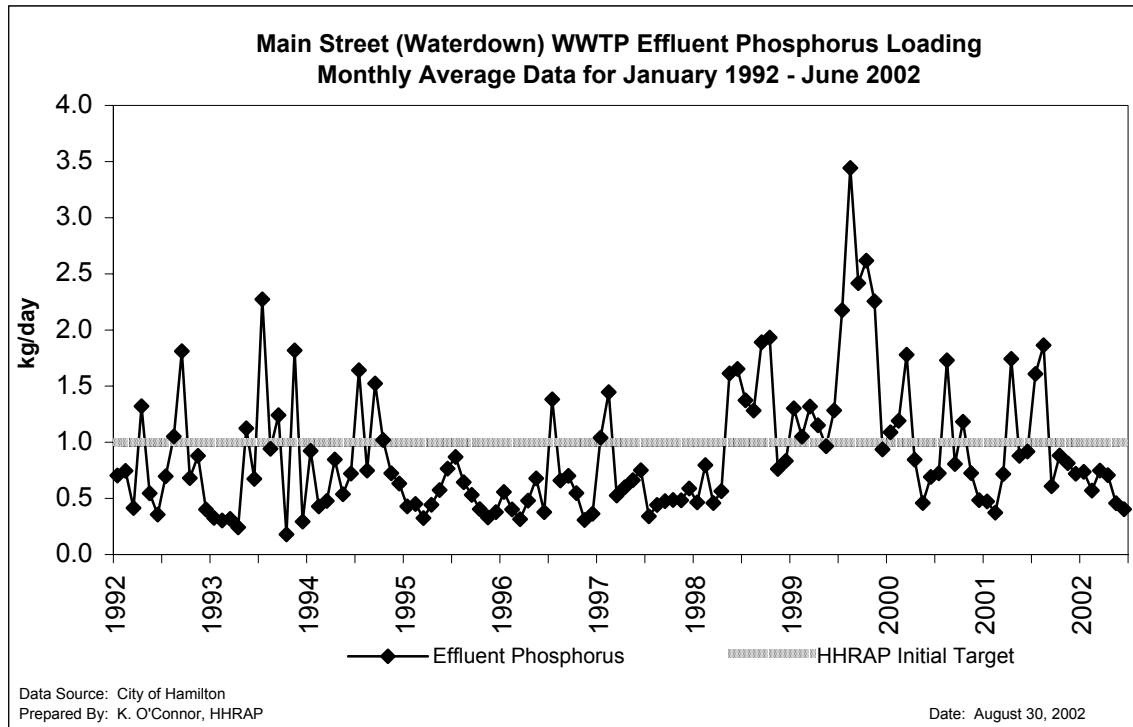
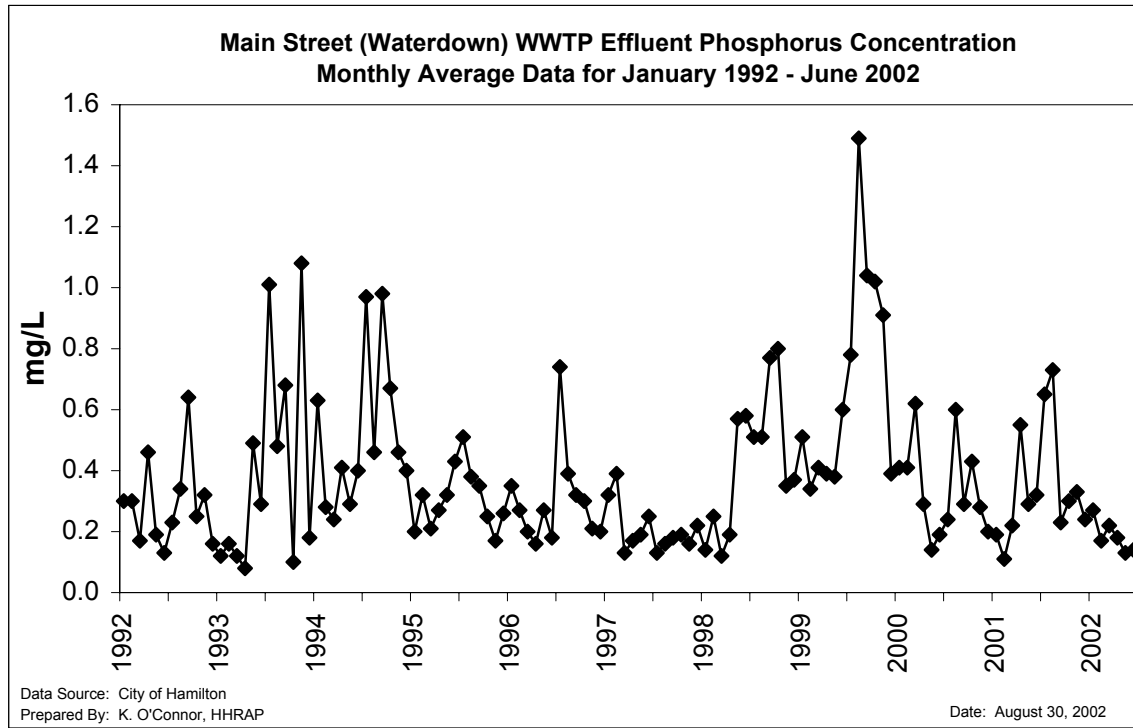


Figure 20. Main St (Waterdown) WWTP Effluent Ammonia Concentrations and Loadings

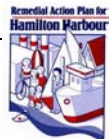
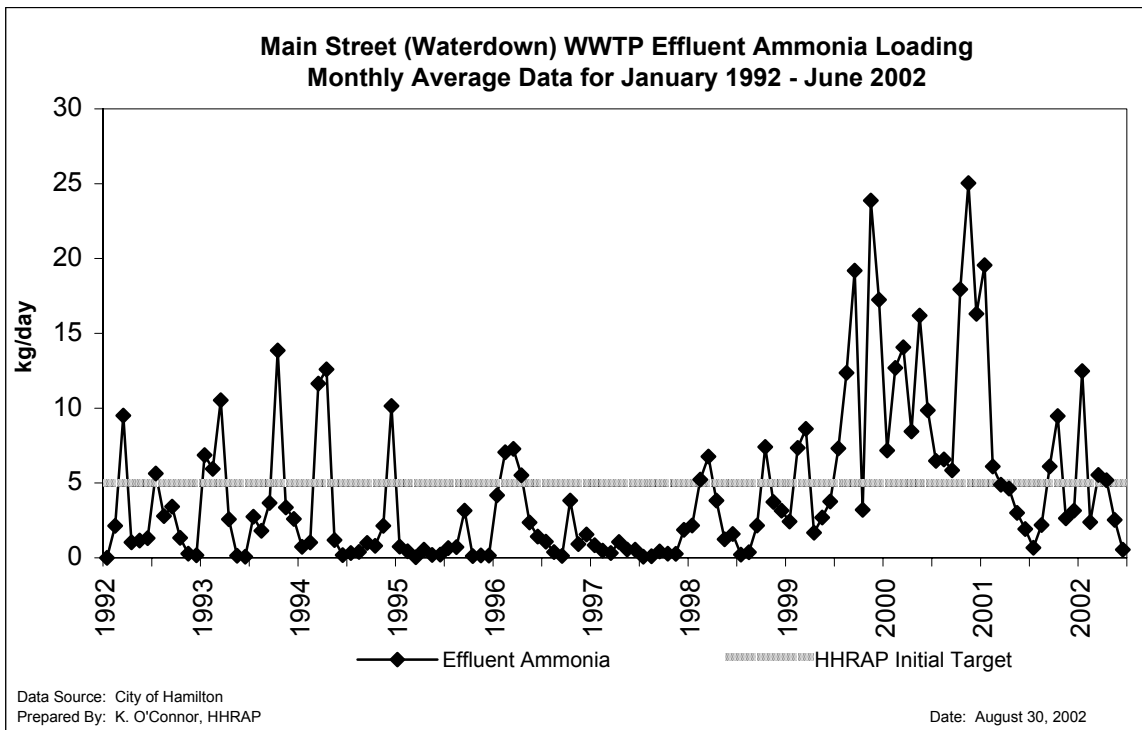
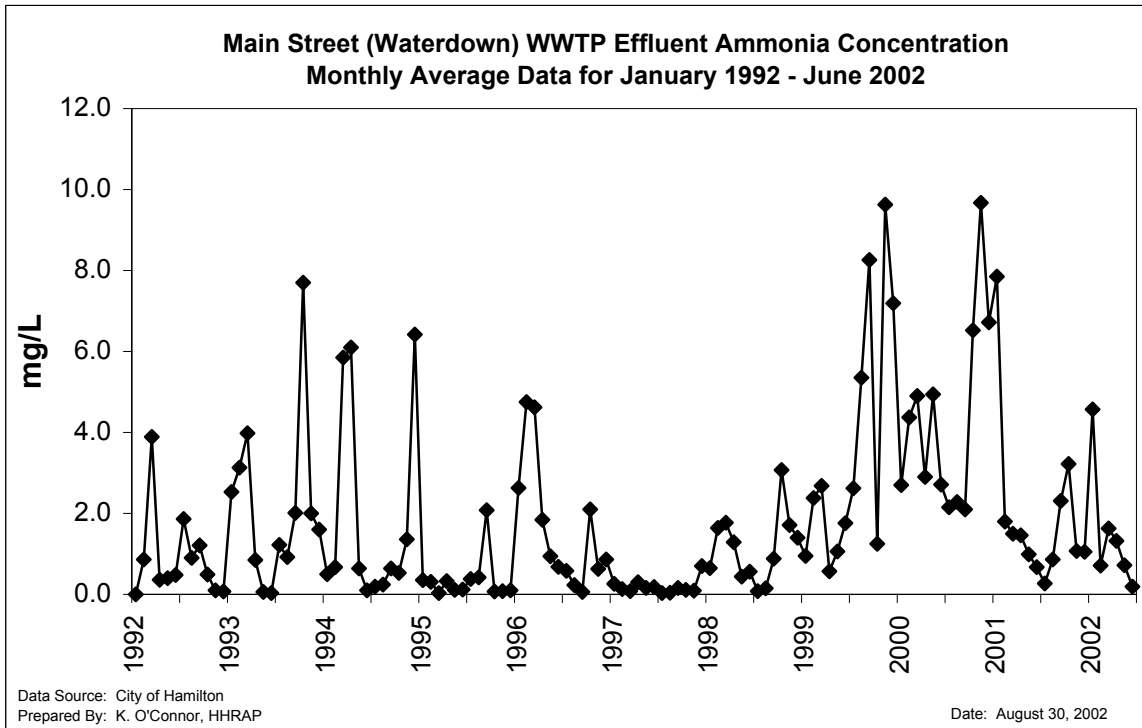


Figure 21. Main St (Waterdown) WWTP Effluent Suspended Solids Concentrations and Loadings

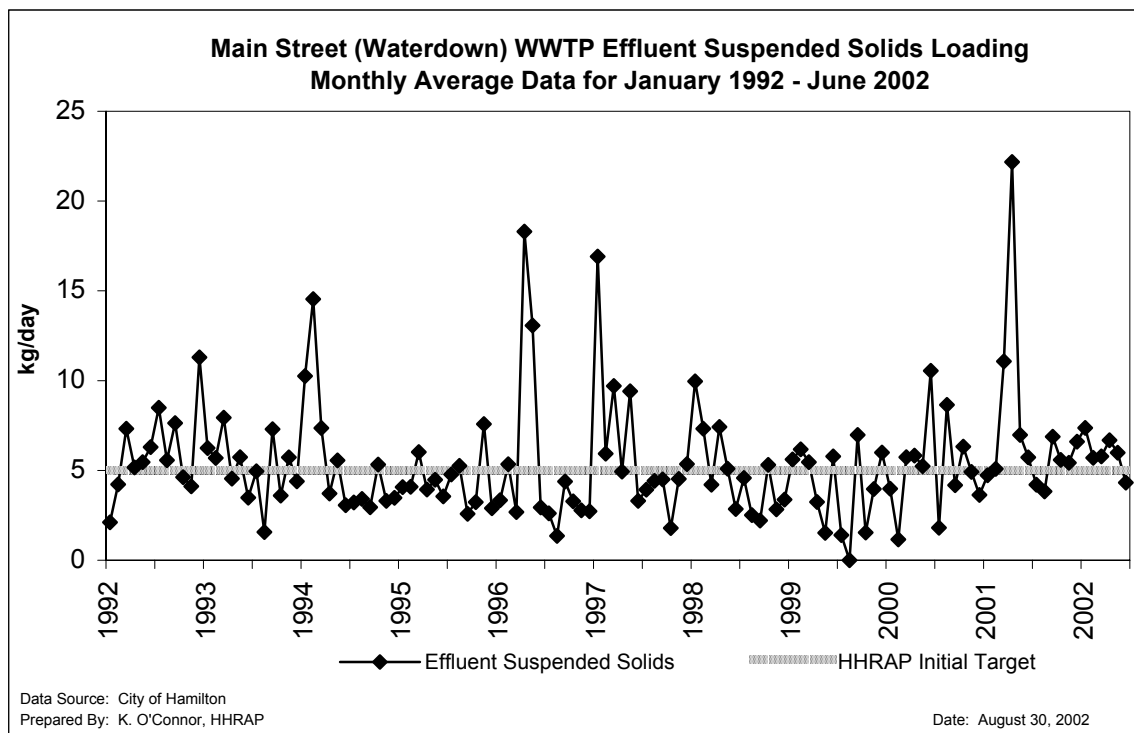
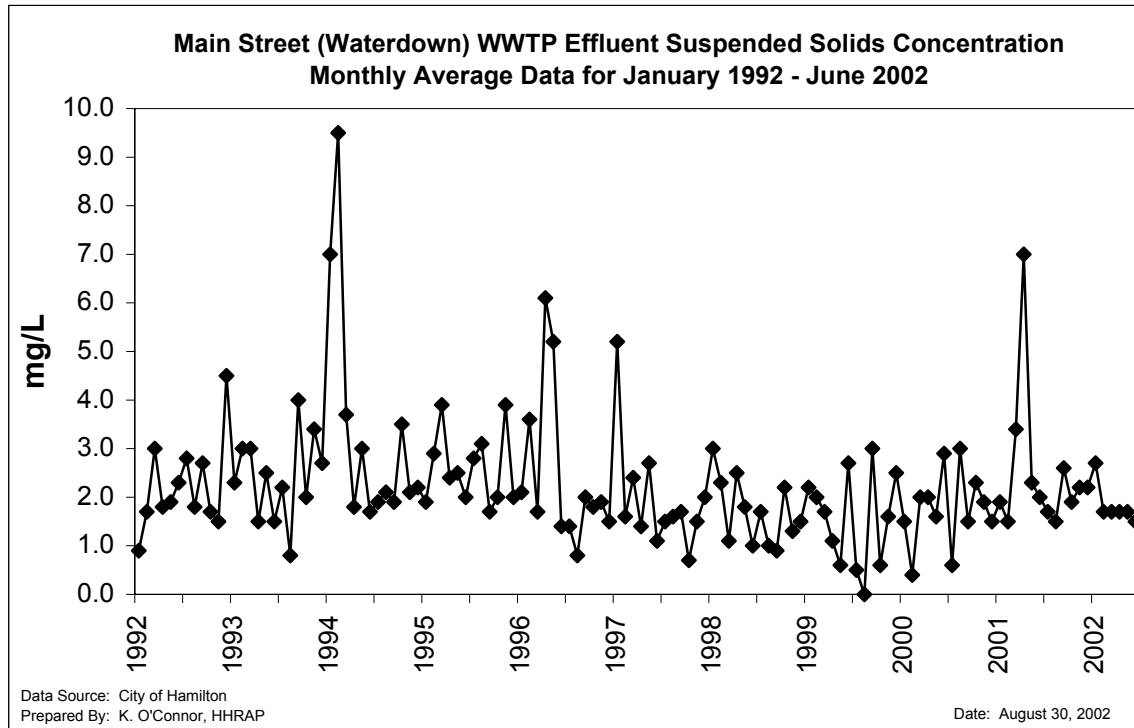
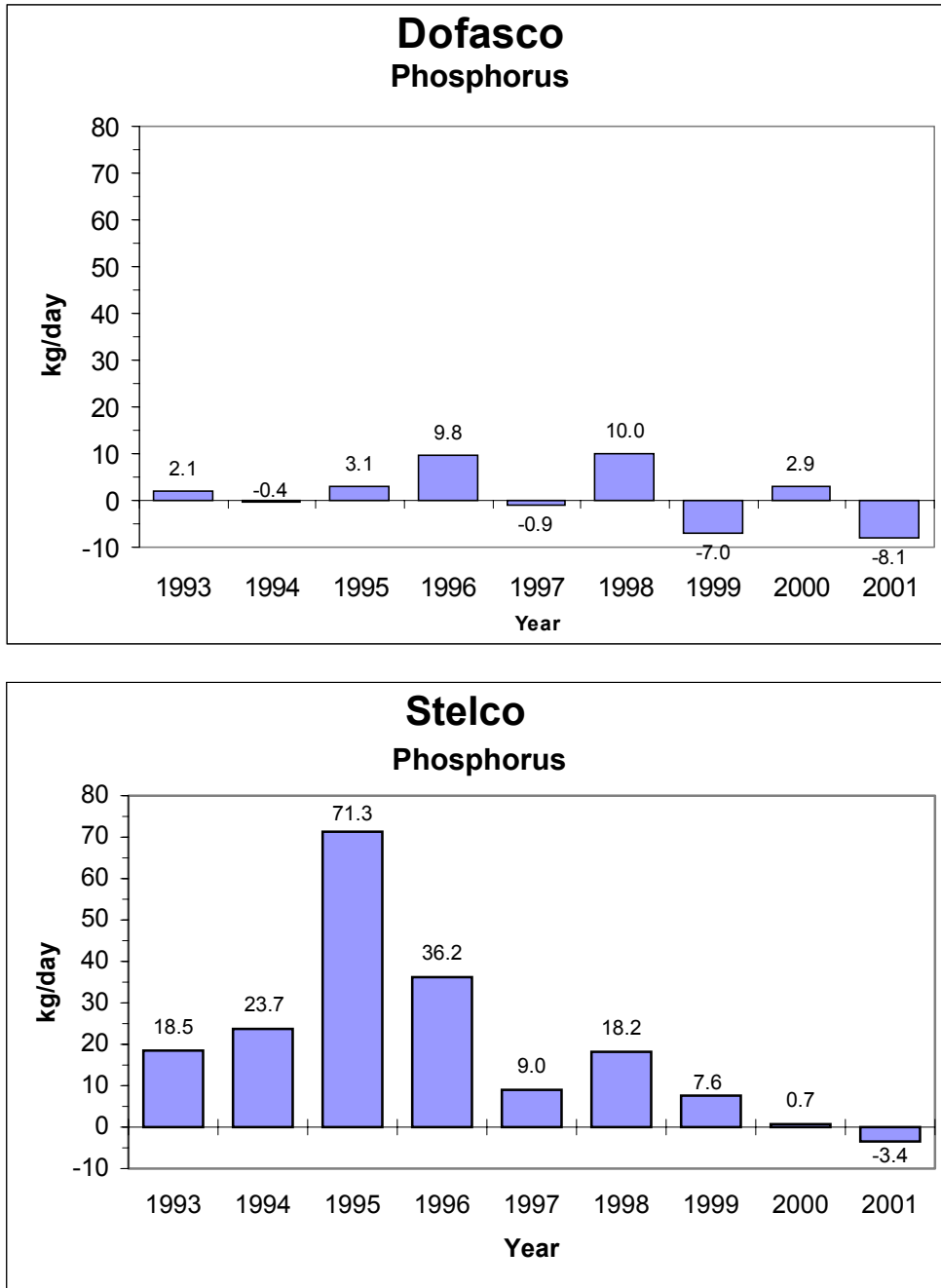


Figure 22. Net Loading of Phosphorus from Dofasco and Stelco to Hamilton Harbour



Data Source: Dofasco and Stelco  
 Prepared By: K. O'Connor, HHRAP

Date: August 20, 2002

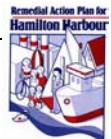
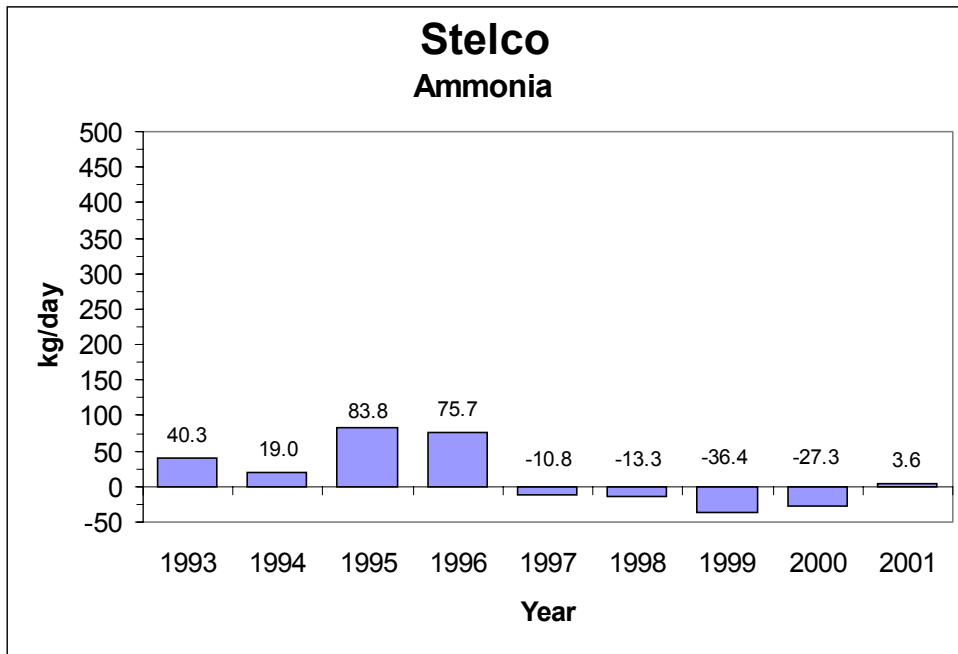
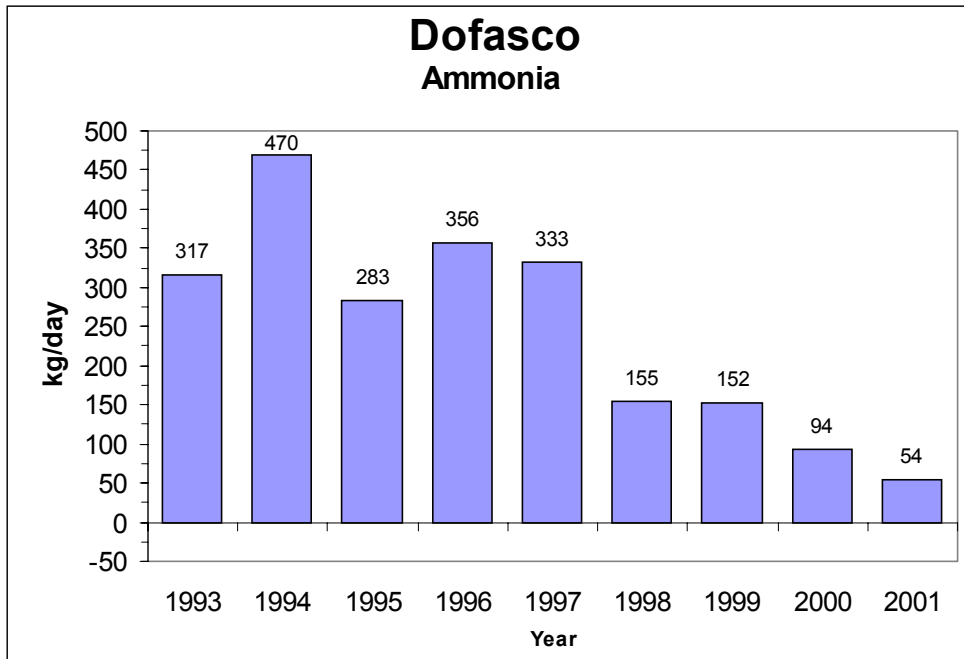


Figure 23. Net Loading of Ammonia from Dofasco and Stelco to Hamilton Harbour

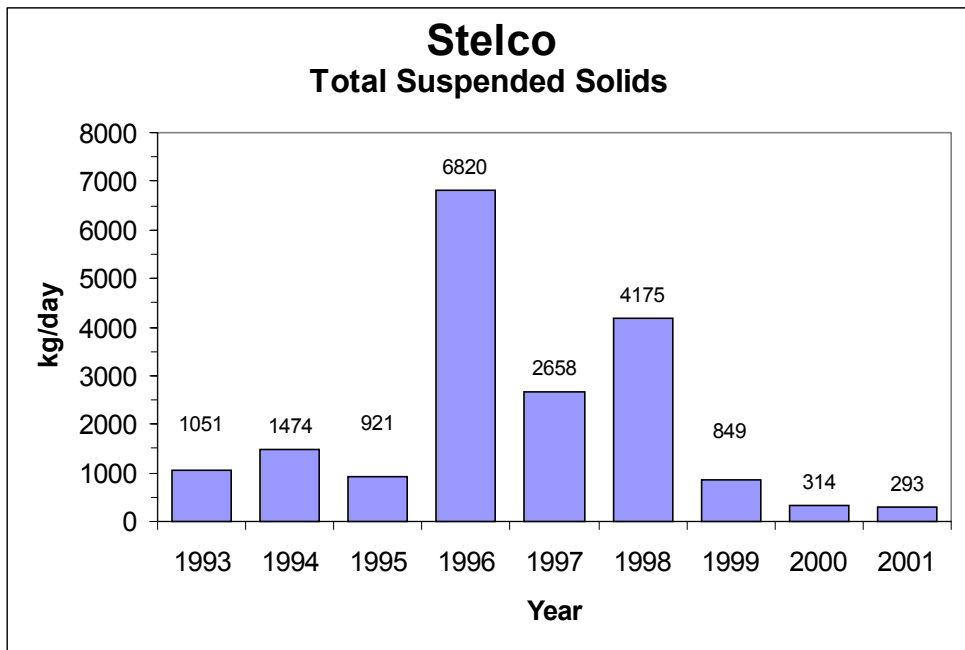
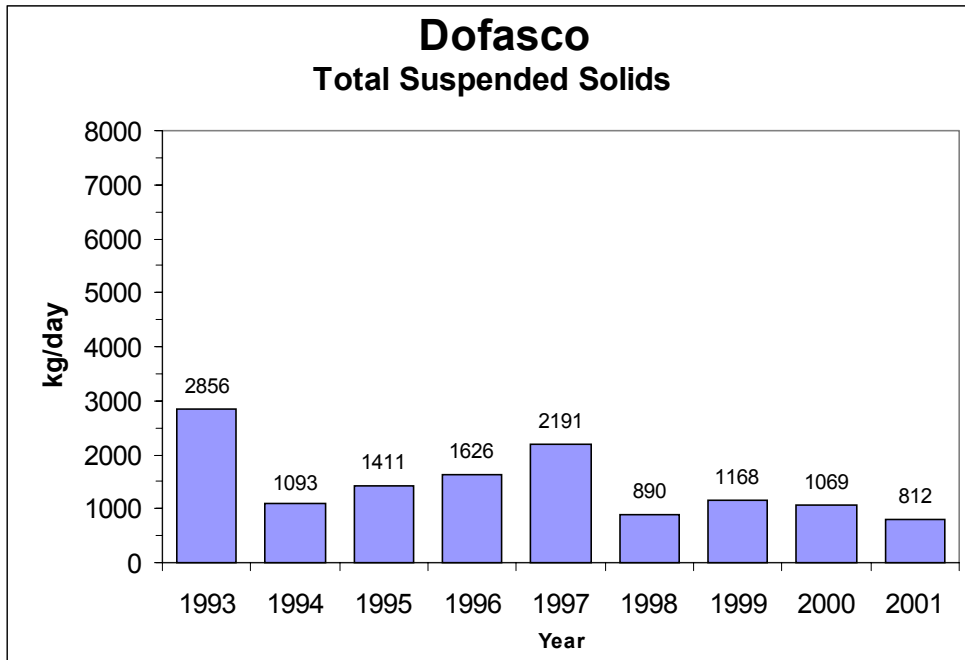


Data Source: Dofasco and Stelco  
 Prepared By: K. O'Connor, HHRAP

Date: August 20, 2002

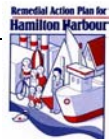


Figure 24. Net Loading of Suspended Solids from Dofasco and Stelco to Hamilton Harbour



Data Source: Dofasco and Stelco  
 Prepared By: K. O'Connor, HHRAP

Date: August 20, 2002



### IV.1.5 Monitoring of Harbour Water Conditions

#### Recommendation No. WQ – 1e

(1992 Rec. 1)

*In order to properly gauge the impact of current and proposed remedial measures, it is recommended that the conditions (dissolved oxygen, clarity, algae, ammonia, phosphorus and nitrate) be monitored in the Harbour and Cootes Paradise in accordance with the specifications in Table WQ – 1e, and that confidence in our ability to predict changes be improved by analysis of these data and, if required, by development of models.*

#### Responsible Agencies

EC, OMOE, RBG, City of Hamilton

#### Ongoing Targets

WQ - 1e.1 To meet the frequency and intensity of specified sampling as listed in Table WQ – 1e immediately.

Table WQ – 1e: Criteria for Determining Compliance with RAP Goals

GOAL	COMPLIANCE FORMULA
Compliance with environmental conditions with respect to Phosphorus, Secchi depth and chlorophyll a	13 out of 13 samples analysed weekly at the centre station from June to August are at or better than the targeted level.
Compliance with environmental conditions with respect to unionized ammonia	Weekly samples from March to June at the centre station are not to exceed 0.02.
Compliance with environmental conditions with respect to dissolved oxygen	Weekly samples at 1 metre from bottom at centre station, from July to September are at or better than the targeted level.
Compliance with environmental conditions with respect to E. coli	Daily samples meet target on every day that is 48 hours after a rain event.

#### Status

Environment Canada researchers at the National Water Research Institute (NWRI) monitor the required environmental conditions at the centre station (EC Station 52) weekly from May to October (Figures 25 – 28). Although weekly sampling is recommended at only one location, periodically Hamilton Harbour is targeted for intense monitoring where conditions are monitored at 23 more stations Harbour-wide to confirm representativeness of the centre station.

Monitoring is conducted annually with more comprehensive monitoring to be carried out when initial loading targets have been met, in order to support decision-making related to proceeding to final targets. Model reviews for total phosphorus will be conducted on an as needed basis determined by the RAP Technical Team, rather than per an assigned time frame. Input on the decisions and data input into any modeling exercise will need to be a partnership effort.

The Royal Botanical Gardens monitors water conditions in Cootes Paradise. Data on average water clarity, total ammonia, and dissolved oxygen are presented in Figures 29 – 31 respectively.

The Public Health Department at the City of Hamilton is responsible for determining compliance for E. coli levels at the two beach areas in Hamilton Harbour (Bayfront Park and Pier 4 Park). Routine sampling at five sample sites per beach area is done once a week, unless there is a posting at which time the frequency increases. Bacteria levels caused the Pier 4/Tug Boat Beach to be closed for 47 days in 2001 and the Bayfront Park Beach to be closed for 70 days in 2001. An investigation by Environment Canada scientists at NWRI into the source of high bacteria levels causing beach closures at the Pier 4 and Bayfront Park beaches was started in 2001. Details on beach closures and the research study are in the Research and Monitoring Component, Recommendation RM – 3.

Figure 25. Total Phosphorus (unfiltered) Concentration at Centre Station, Hamilton Harbour

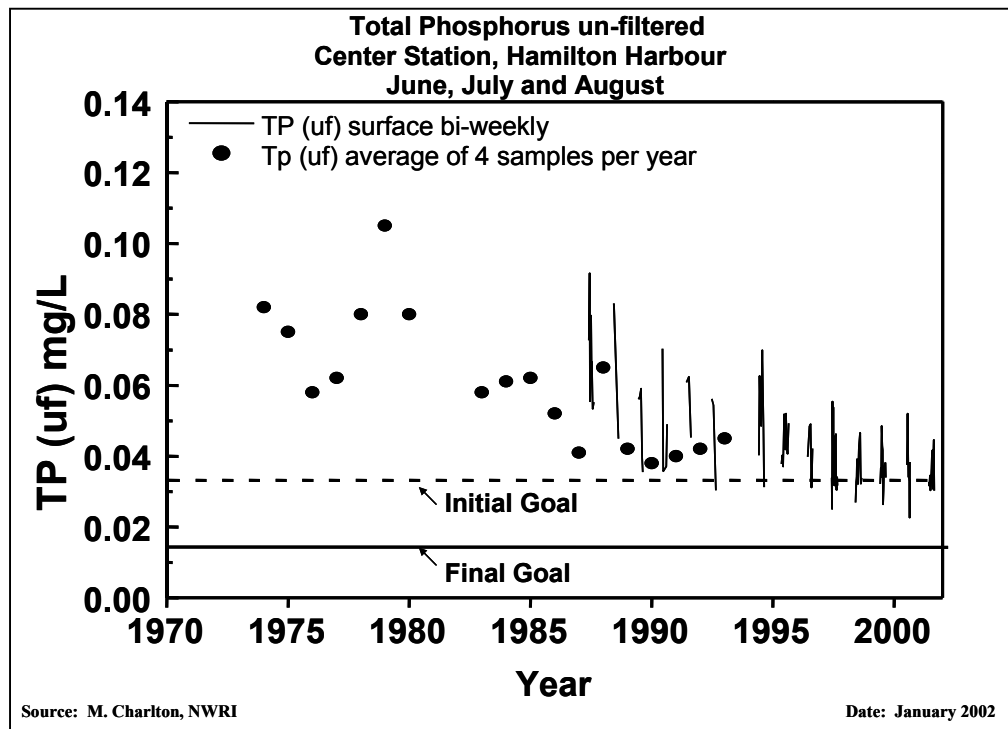


Figure 26. Secchi Depth at Centre Station, Hamilton Harbour

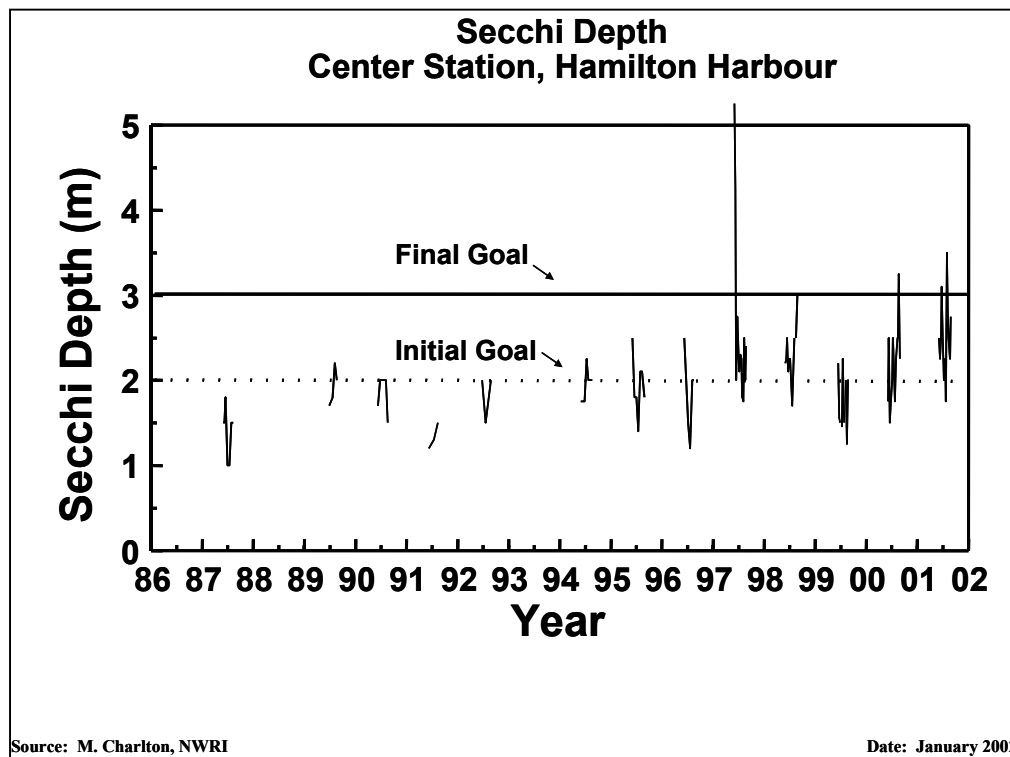


Figure 27. Ammonia Concentration at Centre Station, Hamilton Harbour

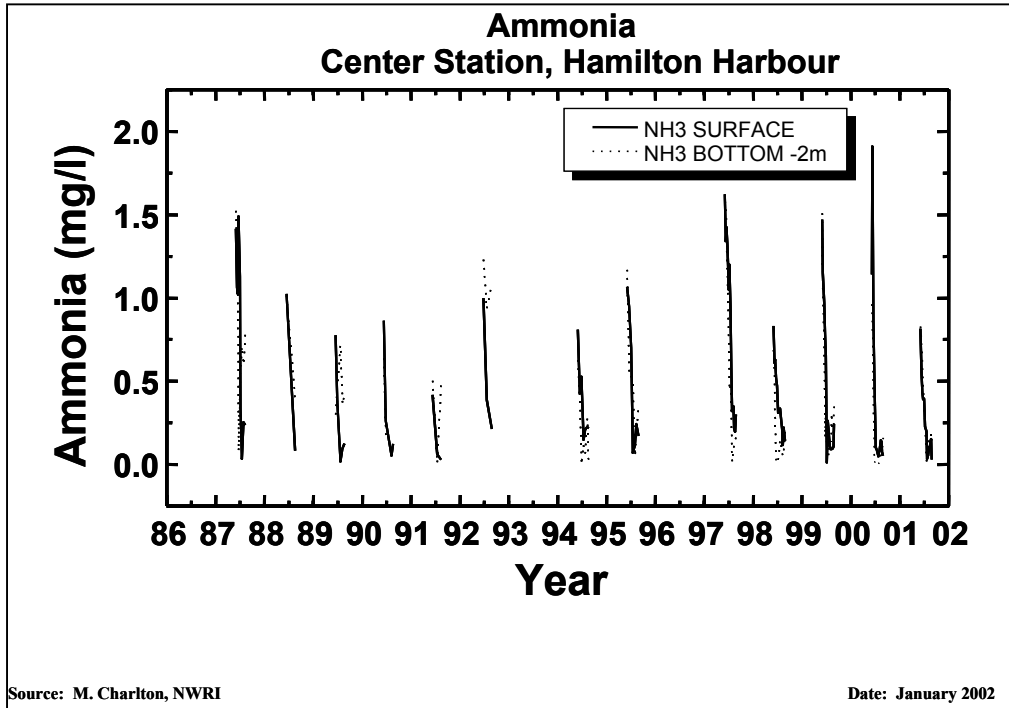


Figure 28. Chlorophyll a Concentration at Centre Station, Hamilton Harbour

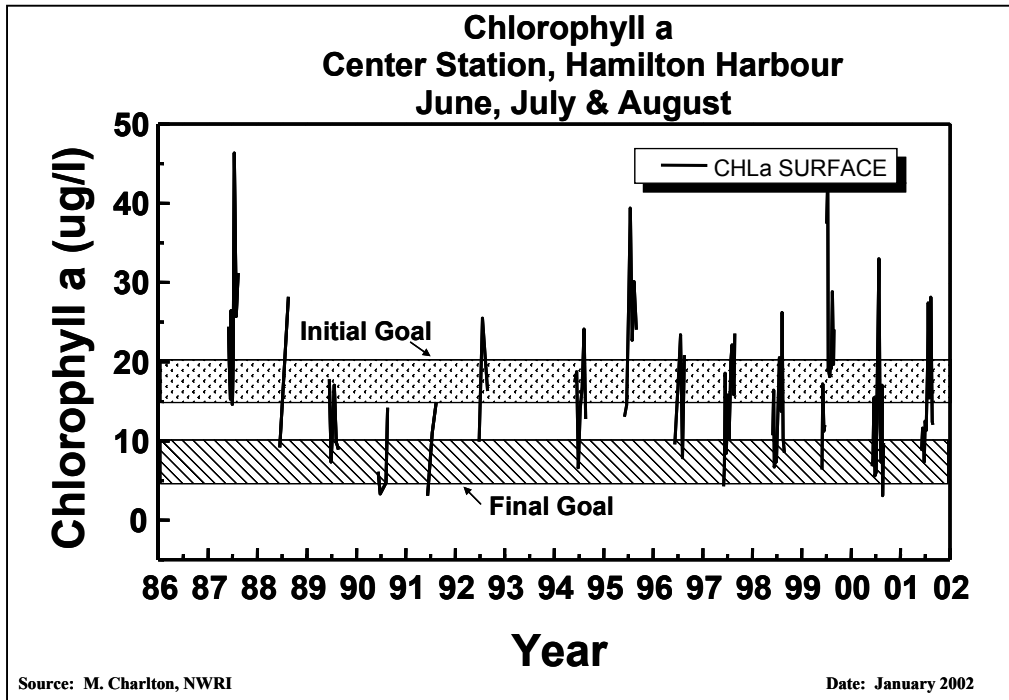


Figure 29. Average Water Clarity in Cootes Paradise

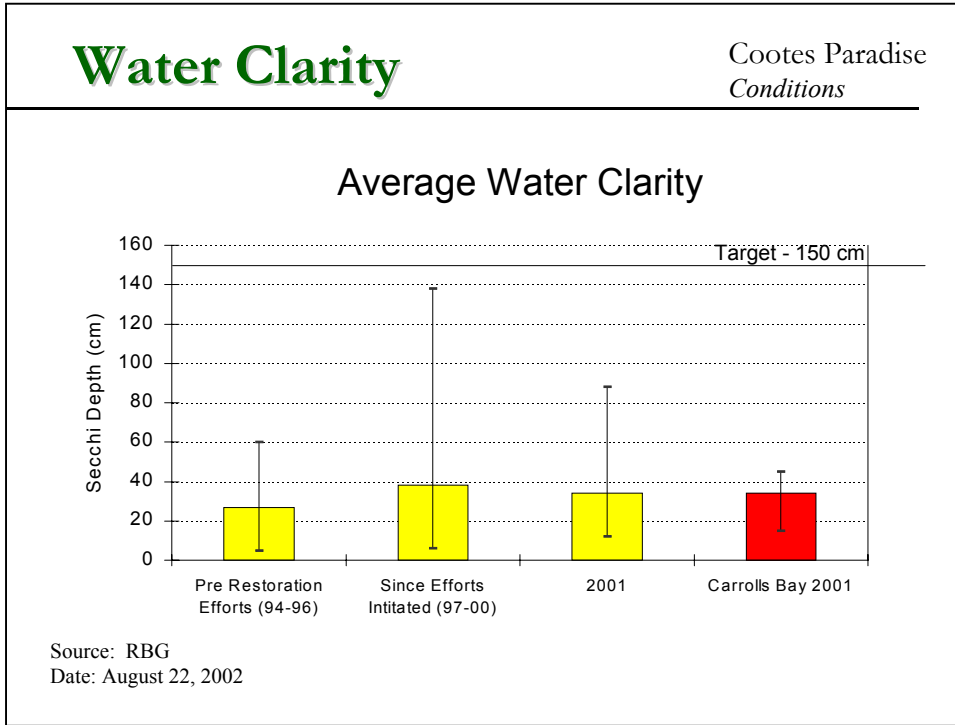


Figure 30. Average Total Ammonia in Cootes Paradise

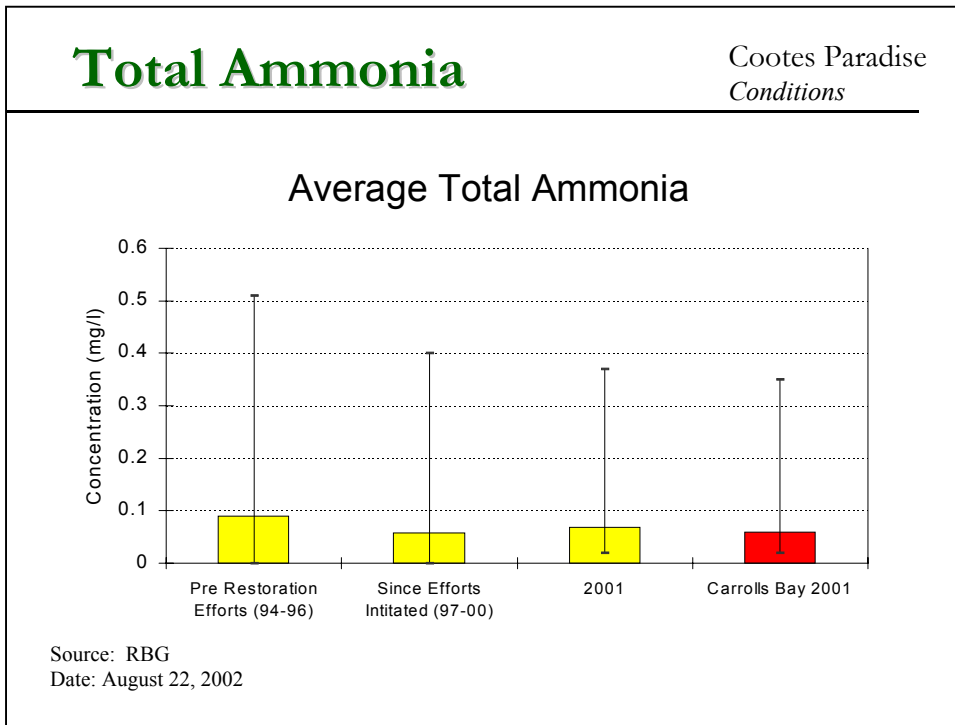
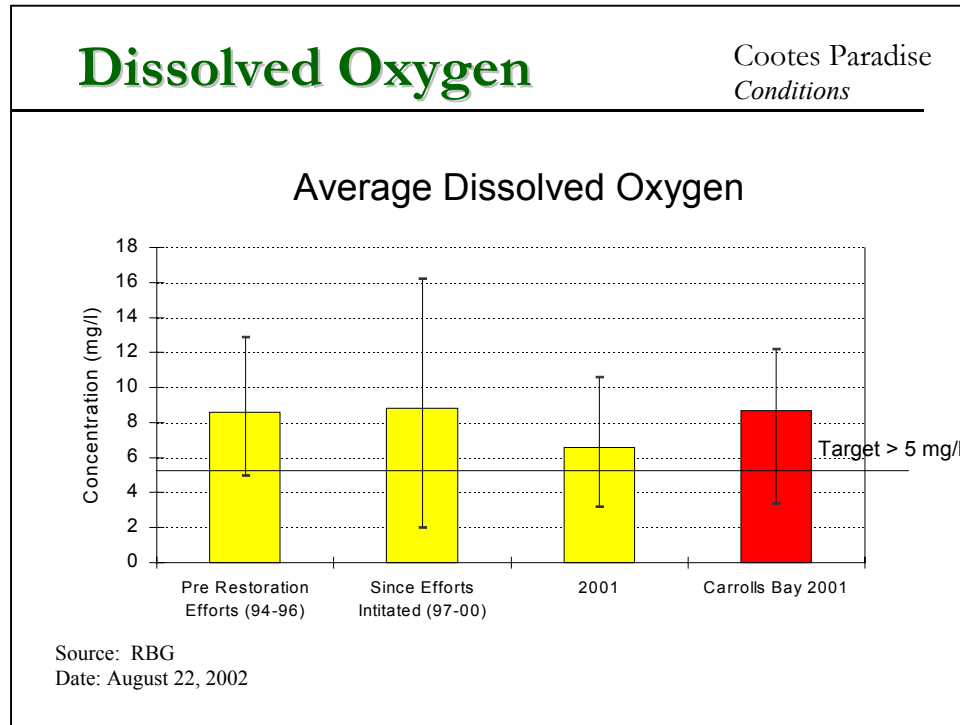


Figure 31. Average Dissolved Oxygen in Cootes Paradise



### IV.1.6 WWTP Loadings Effect on Cootes Paradise and Grindstone Creek

**Recommendation No. WQ – 2**

(1992 Rec. 2)

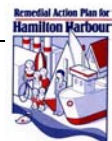
*That ambient water quality criteria and wastewater treatment plant effluent criteria for Cootes Paradise and Grindstone Creek be reviewed to ensure that loadings (including toxic substances and endocrine disrupting compounds – EDCs) from the wastewater treatment plants have no further significant impact on the ecological value of these two areas.*

**Responsible Agencies**

City of Hamilton, EC, DFO, RBG, OMOE, McMaster University

**Short Term Targets**

- WQ – 2.1 **(2003)** To complete a loadings study for the King Street (Dundas) WWTP by the end of 2003.
- WQ – 2.2 **(2003)** To reassess the King Street (Dundas) WWTP effluent requirements by 2003.
- WQ – 2.3 **(2003)** To complete a loadings study for the Main Street (Waterdown) WWTP by the end of 2003.
- WQ – 2.4 **(2004)** To reassess the Main Street (Waterdown) WWTP effluent requirements by 2004.



**Ongoing Target**

WQ – 2.5 EDCs should be factored into any recommendations made with respect to the loadings from the King Street (Dundas) WWTP and the Main Street (Waterdown) WWTP on the Cootes Paradise Marsh and Grindstone Creek estuary respectively.

**Status**

Cootes Paradise Marsh and Grindstone Creek Estuary are natural marshes located at the west end of Hamilton Harbour. Marshes are used by fish and wildlife during all stages of life, but none so vulnerable to water quality problems as during reproduction and early life development. Both areas are influenced by effluent from WWTPs and the interactions with annual Lake Ontario water level variations.

The effect of loadings from the King St (Dundas) WWTP on Cootes Paradise Marsh are being studied through research projects that began in 1999 and are being examined by the Cootes Paradise Water Quality Group led by Royal Botanical Gardens (RBG) that began discussions in 2001. Loadings from the Main St (Waterdown) WWTP into Grindstone Creek remains to be addressed; even though the need for examination was reinforced in the analysis for the Grindstone Creek watershed plan. The RBG monitors loadings and concentrations of relevant parameters as part of a comprehensive monitoring program for Cootes Paradise and Grindstone Creek.

The Class Environmental Assessment to provide wastewater treatment for the Town of Dundas and the Town of Flamborough (both part of the amalgamated City of Hamilton in 2000) was completed in 1998. The preferred solution involved maintaining the existing rated capacity of the King St (Dundas) WWTP, and construction of equalization storage and diversion infrastructure to direct flow in excess of the King St (Dundas) WWTP capacity to the Woodward Avenue WWTP. This work was underway in 2001.

Endocrine disrupting compounds (EDCs) are a new area of concern, appearing in scientific literature, but have not been studied for specific effects in Cootes Paradise Marsh or the Grindstone Creek Estuary. Since these chemicals can have their greatest effects on reproduction and early stage development of a wide variety of resident and migratory animals, the effect of EDCs should be factored into an evaluation of WWTP loadings to these two Hamilton Harbour marshes.

### IV.1.7 Alternatives to Chlorination

**Recommendation No. WQ – 3**

(1992 Rec. 26)

*While continuing to disinfect wastewater effluent, that alternatives to chlorination or measures to remove the impact of chlorine toxicity by reducing total chlorine levels below 0.02 mg/L be implemented.*

**Responsible Agencies**

City of Hamilton, Regional Municipality of Halton, OMOE

**Short Term Targets**

- WQ – 3.1     **(2002)** Define the system alternatives to be used to reduce the use of chlorine for disinfecting wastewater effluent, or define an appropriate method of dechlorinating wastewater effluent to remove the impact of chlorine toxicity in wastewater effluent at the Harbour's four WWTPs.
- WQ – 3.2     **(2004)** Implement solutions to remove chlorine toxicity at the Harbour's four WWTPs.

**Status**

OMOE compliance limits for chlorine toxicity were postponed at the time that industrial discharge toxicity requirements were being set in order to provide sufficient time for infrastructure improvements and phasing out of chlorine. The subject of effluent chlorination is part of internal OMOE discussion regarding the application of OMOE policies, guidelines and procedures when setting wastewater treatment plant effluent criteria. These discussions have not yet yielded any change to the status quo.

The Region of Halton will be converting the Skyway WWTP to ultraviolet (UV) disinfection sometime in 2002/2003. After conversion is complete, chlorine will only be used during emergency conditions when Halton is unable to use UV.

The City of Hamilton is currently working on implementing UV at both the King St and Main St WWTPs and barring any unforeseen complications, anticipate the systems being online in 2003. At the Woodward WWTP, as UV technologies are not currently an option, an interim solution to remove chlorine toxicity by employing dechlorination should be implemented in 2002/2003.

### IV.1.8 Diversion of WWTP Effluent to Lake Ontario

**Recommendation No. WQ – 4**

(1992 Rec. 50)

*That diversion of WWTP effluent to Lake Ontario be considered only after all other practical and technically feasible options have been implemented.*

**Responsible Agencies**

City of Hamilton and Regional Municipality of Halton

**Ongoing Target**

WQ – 4.1 To not discharge WWTP effluent to Lake Ontario unless absolutely necessary and if deemed necessary it is to be subject to BARC, BAIT, and public discussion of the issues involved.

**Status**

The idea of diverting some or all of the four WWTP outfalls directly into Lake Ontario is considered by RAP Stakeholders as a last resort. Discharge targets to maintain an acceptable level of water quality are more stringent in the Harbour due to the confined nature of the Harbour versus the large dilution capability of the Lake. Scientists believe that if the RAP water quality targets are met through optimization or improved secondary treatment there will not be an immediate need to divert the WWTP effluent streams into Lake Ontario. As of 2002, all technically feasible and practical options to continue discharging in the Harbour had not yet been implemented, so there are no plans to move forward on this issue.

However, as populations grow and impermeable surface areas increase, the volumes and hydraulic loads to the WWTPs will also increase respectively. As this occurs, the effluent quality from the WWTPs must improve in order to meet or maintain RAP targets. This may require tertiary treatment or a return to the possibility of diversion into Lake Ontario.

A study of the ability of Western Lake Ontario to handle treated sewage completed by NWRI has recently been released under the title, “Physical Processes in Western lake Ontario Affecting Sustainable Water Use” (Miners et al 2002).