

# H<sub>2</sub>O Chelsea Water Census Implementation Manual



The H<sub>2</sub>O Chelsea Water Census<sup>1</sup> was developed as a comprehensive follow-up to our Water Questionnaire<sup>2</sup>. The 12 pages of questions contained in the census ask residents to provide detailed information regarding their domestic well, including: rate of water consumption, structural characteristics such as well and pump depth, maintenance history and the frequency and duration of any well-water shortages.

The Water Census also seeks feedback from residents regarding the type of municipal involvement in groundwater management that is considered appropriate by the community.

***The Water Census collects detailed information regarding well- water quantity and quality that will inform municipal planners and residents about opportunities to ensure the sustainable management of the community's groundwater***

Key questions that the Census aims to shed light on:

- ✓ How often do residents of Chelsea experience water shortages, when do these shortages occur and how long do they last?
- ✓ Are some areas of the municipality more prone to water shortages than others, perhaps indicating areas with limited or over-exploited groundwater resources?
- ✓ Are there certain water uses (e.g. watering gardens, swimming pools) or technical aspects of wells (e.g. depth, construction material) which increase the likelihood of experiencing a water shortage?
- ✓ Does the rate of household water-use impact on the likelihood of experiencing a well-water shortage?
- ✓ Would residents be interested in implementing water-use reduction strategies to minimize water shortages in their neighbourhood?

The Water Census can be used as a stand alone research tool (i.e. implementing the Water Questionnaire beforehand, as was done in Chelsea, is not necessary). In any case, we recommend communities implement the Water Census *before* receiving reports of well-water shortages from residents. In our experience, water shortages are rarely, if ever, reported to the municipal

***Water Census responses are kept confidential and are not added to the property's records/files at the municipal office.***

---

<sup>1</sup> Water Census 2005

<http://www.h2ochelsea.ca/PDFs/Water%20survey%202005.pdf>

<sup>2</sup> H<sub>2</sub>O Chelsea Questionnaire 2005

[http://chelsea.ca/english/environment/h2o\\_chelsea.asp](http://chelsea.ca/english/environment/h2o_chelsea.asp)

government. However, residents did report water shortages when asked to do so in the census. Responses from the 2005 Water Census conducted in Chelsea indicated that 8 percent of homes (approx 200 households) had experienced a water shortage in 2005. Despite this significant number, only 2 residents had called the municipality *when* the shortage occurred.

***Water Census Target Area.....***

In Chelsea, our priority was to achieve high census response rates in the areas of the community that had reported a higher incidence of water shortages in our annual Water Questionnaires. Phone calls and house visits were conducted in these *target areas* in order to encourage residents to participate. Residents in the target areas were also given a voucher for a free bacteria-test of their well-water upon submitting their Census.

## **Implementing the Water Census**

The logistics of conducting a Water Census in your community will vary based on the financial and human resources available. Below is a brief description of the ‘Chelsea Experience’.

In November 2005, hard copies of the census were mailed to all residences and businesses in the municipality. The census included a cover letter explaining the initiative, signed by the heads of H<sub>2</sub>O Chelsea’s three project partners. November was selected as the ideal time of the year as it immediately follows the ‘late-summer drawdown’ period (i.e. the months of August, September and October when groundwater levels are typically at their lowest due to decreased rainfall). Residents were asked to submit their census by December 2005. When the deadline came, 798 out of a possible total of 2487 homes had responded to the census (approx 32%). This response rate is considered excellent for a 12 page census and clearly indicates that the community sees the research as both relevant and worthwhile.

***Consult a specialist....***

H<sub>2</sub>O Chelsea worked with survey design and hydrogeologists at the University of Ottawa to develop the Water Census. We recommend that you collaborate with relevant specialists in order to modify our Water Census to best suit your community’s information needs.

The interpretation of the data can be complex due to such variables as: the characteristics of the aquifers in your community, the storage and transmission capacity of individual wells, and annual rainfall variations. A meaningful interpretation of the census data requires the involvement of personnel who specialize in groundwater studies.

It should be noted that when we conduct the census again in the future, an announcement will be placed in the Chelsea municipal newsletter requesting that residents fill out the census again utilizing our online-form version of the census<sup>3</sup>. This electronic version, soon to be available on our project website will eliminate printing, mailing and data entry costs.

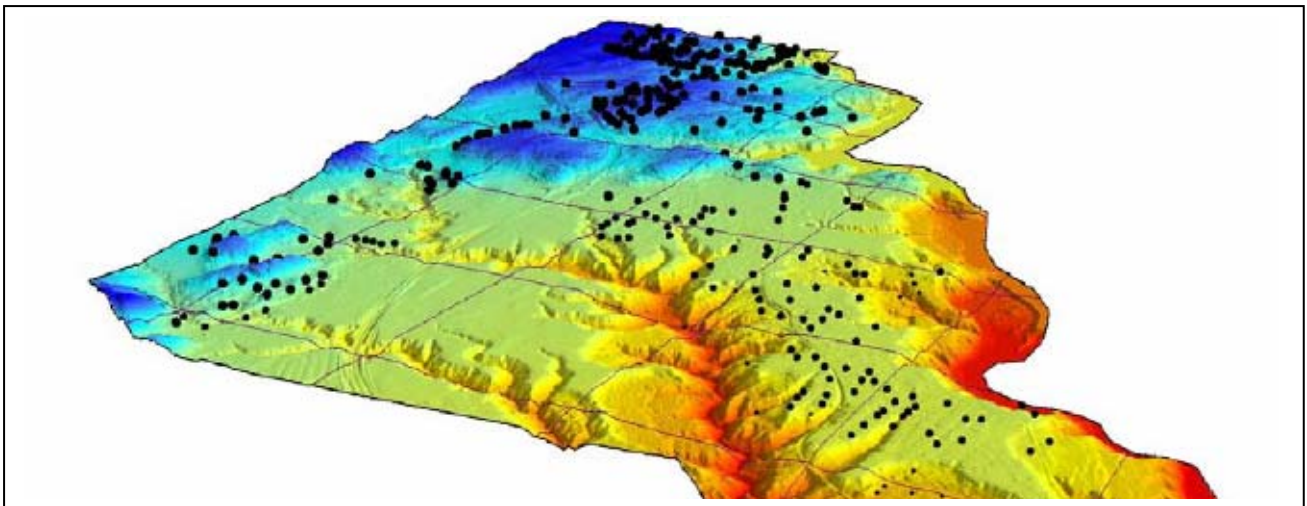
---

<sup>3</sup> H<sub>2</sub>O Chelsea, Water Census Online Form (will be available in late December 2006)  
[www.h2ochelsea.ca](http://www.h2ochelsea.ca)

## Scientific Context

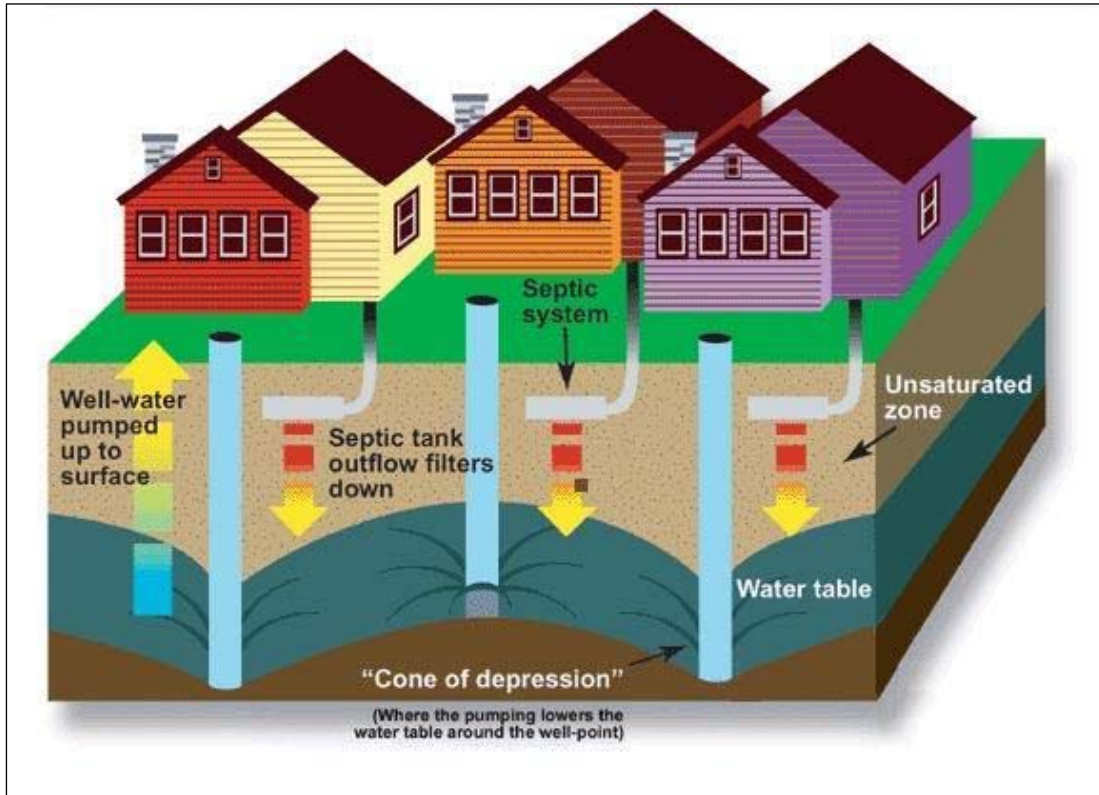
The Water Census was designed to elicit detailed information regarding the location, frequency, lead-up and duration of water shortages in the community. If a shortage is reported when minimal or no water has been used, we can assume that the static water level (height of water in the well when the aquifer reaches equilibrium) of that neighbourhood's water table is near or at the level of the pump of the well in question. Inversely, when a water shortage is reported following extensive well-water usage, the extraction of water has exceeded the storage capacity of the well. In this latter situation, we would expect that if the well aquifer is left to recover, the level of water in the well will rise once again, significantly above the pump, providing the homeowner with a substantial quantity of water once again (the timeframe for this to occur being dependent on the rate of recharge of the aquifer and various characteristics of the well in question).

By mapping the water shortages we can identify patterns throughout the municipality. For example, clusters of homes with similar histories of water shortages (time of year, duration etc.) may be an indication that the water table in that neighbourhood is lowering.



Mapping of Reported Water Shortages in the Water Census Target Area from the 2005 H2O Chelsea Water Census

If mapping water shortages does not demonstrate clusters of homes that reported water shortages (i.e. residences that reported shortages are spatially and/or temporally isolated) then it can be assumed that the shortage has more to do with a technical problem with the well such as the sedimentation of the veins that feed the well, depth of the well is inadequate, or a pump that is placed too high in the water column of the well.



Concentrated housing increases the density of wells in an area. Superimposing cones of depression increases drawdown of the water table level.

Aquifer water levels and water use patterns are strongly related to climate and precipitation, therefore responses from one year may not reflect long-term aquifer behaviour. For this reason, we ask residents to fill out the Water Census (or Water Questionnaire) annually to ensure that we are able to compare the spatial and temporal characteristics of water shortages in the community against rainfall, and temperature averages recorded by Environment Canada.

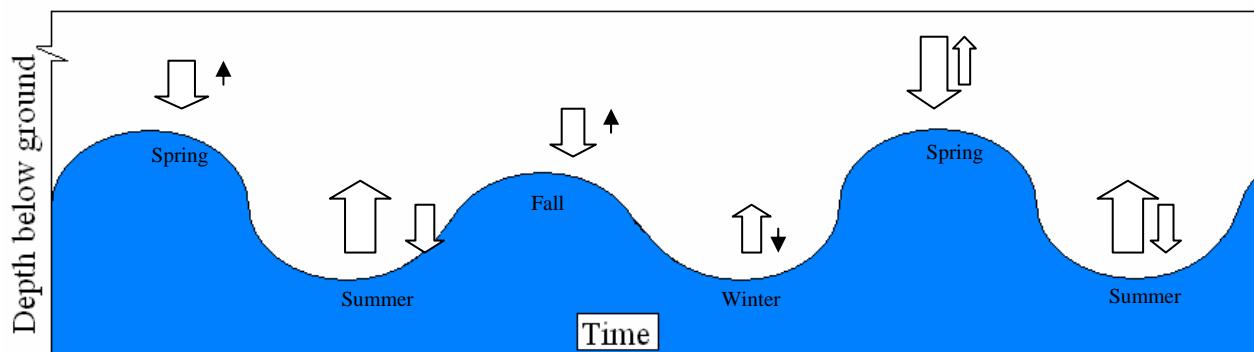


Illustration of normal annual fluctuations of water level due to aquifer discharge (↑) and recharge (↓)

Furthermore, we ask residents to fill out the census in the fall, after the late-summer drawdown (the period of the year when shortages are most likely). We hope this will ensure that key details of any water shortage(s) will be remembered by the census respondent.

## Follow-up Research Options

As is almost always the case with scientific research, your results will likely lead to further questions. A wide-number of options exist to seek additional information regarding water shortages reported in the Water Census. These include:

- ✓ Follow up on responses by contacting individual residents to request additional information (e.g. measure the depth of a particular well and depth of the pump if this information was not available at the time of the census),
- ✓ Targetting water-shortage prone areas for the Static Level program,
- ✓ Install water meters on select wells to record the exact rate of groundwater consumption
- ✓ Targeted aquifer tests (pump tests etc.) to assess aquifer storativity and transmissivity storage and transmission capacity,

For a more detailed description of the scientific context of the census research, including a full-description of the analysis conducted on the Water Census data), please view our *2005 Water Census Report*<sup>4</sup>.

## Impact on Municipal Decision Making

The Water Census provides the municipal government with both technical information about local wells (depth, water shortages etc.) and suggestions from residents regarding groundwater management strategies for the community. Naturally, the hope is that the municipal government will react swiftly and decisively to deal with any areas of concern highlighted by the census data. It is worth mentionning that we are referring to actions that can be taken at a neighbourhood or municipal level (i.e. individual responses are guaranteed to be keptconfidential) and therefore the municipality should not develop an action that targets a single household.

A wide variety of options to better manage groundwater resources are available to municipal governments. For example, in areas that are known to be prone to water shortages, the municipality might choose to:

- ✓ Implement lawn watering by-laws in late summer months
- ✓ Develop regulations requiring a minimum well depth to ensure that new wells in these areas are accessing the more water abundant regional acquifers
- ✓ Minimize the density of homes to be built on lands surrounding 'water-shortage prone' areas
- ✓ Develop a subsidized program to encourage the retrofitting of homes with water-efficient devices (low flush toilets, low flow shower heads etc.).

---

<sup>4</sup> H<sub>2</sub>O Chelsea 2005 Water Census Report (will be available on our project website in late 2006).  
<http://www.h2ochelsea.ca>

Each municipality will have a unique set of options available to them, based on economic, environmental and political factors. H<sub>2</sub>O Chelsea, with funding from the Walter and Duncan Gordon Foundation<sup>5</sup> has developed a resource manual titled *Municipal Approaches to Groundwater Quantity Monitoring and Management*<sup>6</sup>, a comprehensive account of groundwater monitoring options, education initiatives, and municipal regulations and by-laws developed to conserve groundwater resources in Chelsea and other communities across North America.

## Educational Value

The Water Census is not only a scientific monitoring tool but an educational tool as well. By explaining the relationship between the rate of water consumption, housing densities, aquifer characteristics and subsequent well-water shortages the Water Census not only helps raise awareness of the community's dependence on groundwater, it also provides people with an understanding of what behaviour can exacerbate groundwater depletion.

To complement this learning process, H<sub>2</sub>O Chelsea distributes a variety of educational and communication tools<sup>7</sup> detailing ways that residents can reduce their domestic water consumption, particularly during times of the year when water shortages are most likely to occur. Most people want to make water-friendly decisions but are unaware of their options. To change personal behaviour, people must be given practical water-conservation strategies and be educated about the financial and environmental advantages of making these changes in their households.

## Adopt our Program and Resources

In 2007, H<sub>2</sub>O Chelsea will be working to publicize and transfer our research, monitoring and education resources (including the Water Census) as part of our *Water Monitoring Kits Initiative*<sup>8</sup>. All resources we have developed to date will be made available for adoption by interested communities, free-of-charge. Please consult our website<sup>9</sup> to learn more about how you can develop a successful community-based monitoring and education program in your community. We look forward to working with you!

**Contact us:**  
H<sub>2</sub>O Chelsea  
100, chemin Old Chelsea  
Chelsea (Québec)  
J9B 1C1  
(819) 827-1124 X227  
[h2o@chelsea.ca](mailto:h2o@chelsea.ca)

---

<sup>5</sup> Walter and Duncan Foundation Website

<http://www.gordonfn.org/>

<sup>6</sup> H<sub>2</sub>O Chelsea, Water Quantity Manual

[http://www.h2ochelsea.ca/PDFs/Quantity\\_Manual\\_Oct25\\_3.pdf](http://www.h2ochelsea.ca/PDFs/Quantity_Manual_Oct25_3.pdf)

<sup>7</sup> Such as: Environment Canada's Wise Use of Water Brochures

[http://www.ec.gc.ca/water/en/info/pubs/brochure/e\\_broch.htm](http://www.ec.gc.ca/water/en/info/pubs/brochure/e_broch.htm)

<sup>8</sup> H<sub>2</sub>O Chelsea Water Monitoring Kits Initiative

[www.h2ochelsea.ca/adopt\\_programs.htm](http://www.h2ochelsea.ca/adopt_programs.htm)

<sup>9</sup> Water Monitoring Kits Initiative

[www.h2ochelsea.ca/adopt\\_programs](http://www.h2ochelsea.ca/adopt_programs)

## **Appendix A List of Water Census Resources**

The following resources are available on the H<sub>2</sub>O Chelsea website at: [www.h2ochelsea.ca/adopt\\_programs.htm](http://www.h2ochelsea.ca/adopt_programs.htm)

### **1) Water Census**

The H<sub>2</sub>O Chelsea [Water Census](#) is available in Microsoft Word and Adobe PDF formats. Please contact us to receive the Microsoft Word version.

### **2) Online form version of the Water Census and associated Microsoft Access database**

The online form allows residents to complete the census via the Internet, greatly reducing mail out and data input costs. Both of these electronic files can be modified to suit your research and analysis needs.

Please contact H<sub>2</sub>O Chelsea to be sent a copy of the required files. Please visit the Microsoft Office website for help using Microsoft Access: <http://office.microsoft.com/en-us/assistance/CH790018001033.aspx>

### **3) Introductory Letter to Accompany the Water Census**

This [introduction letter](#) can be modified for your Water Census initiative.

## **Appendix B Water Census**

Please see the following page.



## H<sub>2</sub>O Chelsea Water Survey

Dear Resident(s) of Chelsea,

Thank you for agreeing to participate in H<sub>2</sub>O Chelsea's well water survey. **The ultimate aim of this research is to ensure the long-term sustainable management of our water resources.** The survey is designed to collect information regarding water quantity and quality in the Municipality of Chelsea. Your input will provide municipal planners and all residents of Chelsea with a better understanding of Chelsea's groundwater resources.

**Your survey response will not be included in your property files at the Municipality.** All questionnaire responses are confidential and will be used only by H<sub>2</sub>O Chelsea for the purposes of this study.

Please note that the information contained in the report will be presented in such a way **that results for individual properties cannot be inferred.** Results of the survey will be compiled, and a public report of the findings produced early in 2006.

We have put together a collection of questions that we ask you to **please answer honestly and accurately** in order to make the survey as useful as possible. If you are unsure of an answer, please do not answer the question. Some questions may not apply to all respondents, so please only answer those that apply to you.

Once again, we thank you for your participation and encourage everyone to learn more about this and other H<sub>2</sub>O Chelsea initiatives. Please see the fact sheet contained in this survey package for more information about the Water Survey and our other water-monitoring and education programs.

Sincerely,

H<sub>2</sub>O Chelsea Water Survey, 2005  
100, chemin Old Chelsea, Chelsea (Québec) J9B 1C1  
(819)827-1124, extension 226

Surname : \_\_\_\_\_ Given name(s) : \_\_\_\_\_

Street No : \_\_\_\_\_ Street : \_\_\_\_\_ Postal Code : \_\_\_\_\_

E-mail\* : \_\_\_\_\_ Telephone : \_\_\_\_\_

\* By providing us with your email address, H<sub>2</sub>O Chelsea will be able to forward you updates regarding this project and other water research initiatives. We do not share your information with any other organization.

### Section 1: Residential Information

1.1 Are you or your spouse/partner the owner of this residence?

- Yes  No

1.2a Is this your permanent place of residence?

- Yes  No

1.2b If this is not your permanent place of residence, please check which season(s) you primarily spend time at this residence.

- Winte  Spring  Summer  Fall  
Other : \_\_\_\_\_  
(e.g. weekends)

1.2c How long have you been living here?

- 1-2 years  3-5 years  5-10 years  
 10-20 years  More than 20 years

1.2d How many people in each age group currently live in the residence?

- Less than 4 years # \_\_\_\_\_  
From 4 to 12 years # \_\_\_\_\_  
From 13 to 19 years # \_\_\_\_\_  
From 20 to 65 years # \_\_\_\_\_  
Over 65 years of age # \_\_\_\_\_

1.2e For how long during the year is this residence occupied?

- 1 month or less  1-3 months  3-6 months  
 6-9 months  9-12 months  full year

1.3 What is the size of your property:

\_\_\_\_\_ (acres)  Do not know

*If possible, please refer to cadastral documents or your Plan de localisation if you are unsure about the size of your property. These documents are usually presented to you by your notary at the time of purchasing your property*

### Section 2: Water source information

This section is focused on gaining background information regarding your water source(s). Water sources include all types of wells (dug, sand points and drilled etc.) and intake pipes that draw water from lakes and rivers.

2.1a How many water sources do you have (wells + intakes from lakes + intakes from rivers)?

- 1  2  3  4  5

2.1b How many wells (surface and/or drilled) do you have on your property?

- 1  2  3  4  5

2.1c How many of those wells do you actually use?

- 1  2  3  4  5

2.1d If you have a well that you don't use, why don't you use it?

- water quantity problem  
 water quality problems  
 technical problems (e.g. pump is broken)  
 other

\_\_\_\_\_  
(please describe)

# Water Source #1

## Section 3 :

This section seeks detailed responses regarding each of your water sources. Please complete one Section 3 for each water source that you use. We have included two Section 3 forms. If you require additional copies (because you use more than two water sources), please contact us and we will forward you additional copies at (819)827-1124, extension 226)

### Types of Water Use:

3.1a Please indicate the type of water source

- Deep/Drilled well
- Surface/Dug well
- Intake from a river
- Intake from a lake

3.1b Please check off the use(s) of this water source (i.e. check off as many boxes as apply)

- drinking     cooking     washing
- outdoor use (e.g. lawn watering)

3.1c Do you treat this water before drinking it (e.g. ultraviolet system water softeners)?

- Yes     No
- n/a (I do not drink this water)

3.1d If you do treat this water before drinking it, why do you do so?

- one bad water quality test result in the past
  - several bad water quality test results in the past
  - uncomfortable with the idea of drinking untreated water
  - do not know why I treat it
  - other
- 

3.1e If you do not use this water source for drinking, what do you use for drinking?

- bottled water
- another water source (i.e. another well, lake or stream intake)

### Shared Wells

Please answer questions 3.2a and 3.2b only if the water source is a well.

3.2a Is this well used by more than one residence?

- Yes                       No

Please refer to your well driller's report for questions 3.3c to 3.3g. Answer only the questions for which the required information is included in your well driller's report. If you are unsure about a question, please leave those question blank and proceed to the next. If you do not have your well driller's report or have not made the measurements yourself recently, please skip questions 3.3c to 3.3i and proceed to question 3.4 (well maintenance) .

3.2b If yes, how many residences share this well?

- 2     3     4     5     More than 5
- Unknown

3.3a. If this water source is a well, do you have the well driller's report?

- Yes                       No (skip to 3.4)

3.3b. Year Drilled \_\_\_\_\_ (e.g. 1998)

3.3c. Please indicate

- I. Depth to bedrock \_\_\_\_\_  meters  feet
- II. Depth of hole \_\_\_\_\_  meters  feet
- III. Depth to top of Screen \_\_\_\_\_  meters  feet
- IV. Screen length \_\_\_\_\_  meters  feet
- V. Length of casing \_\_\_\_\_  meters  feet
- VI. Casing diameter \_\_\_\_\_  meters  feet

3.3d. Material used to seal the casing

- cement-bentonite     bentonite
- other \_\_\_\_\_

3.3e. Depth of pump at time of drilling

\_\_\_\_\_  meters  feet

3.3f. Has the depth of the pump been altered since it was first installed?

- yes, it was raised
- yes, it was lowered
- no, never changed
- do not know

3.3g. Static level at time of drilling

\_\_\_\_\_  meters  feet

3.3h. Flow rate at time of drilling

- \_\_\_\_\_  cubic meters/hour
- \_\_\_\_\_  gallons/hour
- \_\_\_\_\_  litres/min
- \_\_\_\_\_  gallons/min

**3.4 If you use a well, what maintenance, retrofitting or repair has been performed on the well? Please check off the appropriate options and indicate the frequency and when the work was done.**

Type of maintenance/repair:	# of times in last 20 years (frequency)	Most recent year
<input type="radio"/> Disinfection or shocking of well	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Disinfection of waterlines and plumbing	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Hydrofracturing	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Repair of waterline leak	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Landscaping to eliminate pooling of water around the well	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Replaced the pump	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> pump raised	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> pump lowered	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Drilled the well deeper	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Other, Please specify: _____ _____	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago

### Section 3.5: Water shortages

The questions in this section are designed to provide information about the history of water shortages *for this water source*.

3.5a Have you experienced any water shortages so far during 2005?

- Yes     No

**3.5b If yes, please check off during which season(s) and the frequency and duration of the shortages ?**

*Please include any additional information regarding experienced water shortages in the comments section at the end of the survey.*

Season	Month	Duration of shortage (Number of hours or days)	Frequency of Shortages (times/month)
<input type="radio"/> Winter	<input type="radio"/> December <input type="radio"/> January <input type="radio"/> February <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Spring	<input type="radio"/> March <input type="radio"/> April <input type="radio"/> May <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Summer	<input type="radio"/> June <input type="radio"/> July <input type="radio"/> August <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Fall	<input type="radio"/> September <input type="radio"/> October <input type="radio"/> November <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know

3.6a Did you experience any water shortages during 2004?

- Yes  No

3.6b If yes, please check off during which season(s) and the frequency and duration of the shortages ?

Season	Month	Duration of shortage (Number of hours or days)	Frequency of Shortages (times/month)
<input type="radio"/> Winter	<input type="radio"/> December <input type="radio"/> January <input type="radio"/> February <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Spring	<input type="radio"/> March <input type="radio"/> April <input type="radio"/> May <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Summer	<input type="radio"/> June <input type="radio"/> July <input type="radio"/> August <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Fall	<input type="radio"/> September <input type="radio"/> October <input type="radio"/> November <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know

3.7 Do you recall any water shortage(s) before 2004?

- More than a couple of times a year  
 Once or twice a year  
 Never  
 I don't remember

(b) insufficient water from the original water source

- Yes  No

(c) Other

Please specify: \_\_\_\_\_

3.8 Have you ever installed an additional water source (i.e. drilled a second well, or installed an intake from a lake or river) because of:

(a) poor water quality of the original water source

- Yes  No

## Water Source # 2

### Section 3 :

Please complete it only if you use more than one water source. If you do not use more than one water source, please move on to Section 4 on page 11 of the Water Census.

If you require additional copies of this Section 3 form (because you use more than two water sources), please contact us and we will forward you additional copies.

#### Types of Water Use:

3.1a Please indicate the type of water source

- Deep/Drilled well
- Surface/Dug well
- Intake from a river
- Intake from a lake

3.1b Please check off the use(s) of this water source (i.e. check off as many boxes as apply)

- drinking     cooking     washing
- outdoor use (e.g. lawn watering)

3.1c Do you treat this water before drinking it (e.g. ultraviolet system water softeners)?

- Yes     No
- n/a (I do not drink this water)

3.1d If you do treat this water before drinking it, why do you do so?

- one bad water quality test result in the past
- several bad water quality test results in the past
- uncomfortable with the idea of drinking untreated water
- do not know why I treat it
- other

\_\_\_\_\_

3.1e If you do not use this water source for drinking, what do you use for drinking?

- bottled water
- another water source (i.e. another well, lake or stream intake)

#### Shared Wells

Please answer questions 3.2a and 3.2b only if the water source is a well.

3.2a Is this well used by more than one residence?

- Yes                       No

3.2b If yes, how many residences share this well?

- 2     3     4     5     More than 5
- Unknown

3.3a. If this water source is a well, do you have the well driller's report?

- Yes                       No (skip to 3.4)

Please refer to your well driller's report for questions 3.3b to 3.3h. Answer only the questions for which the required information is included in your well driller's report. If you are unsure about a question, please leave those question blank and proceed to the next. If you do not have your well driller's report or have not made the measurements yourself recently, please skip questions 3.3b to 3.3h and proceed to question 3.4 (well maintenance) .

3.3b. Year Drilled \_\_\_\_\_ (e.g. 1998)

3.3c. Please indicate

- I. Depth to bedrock                      \_\_\_\_\_  meters  feet
- II. Depth of hole                              \_\_\_\_\_  meters  feet
- III. Depth to top of Screen                      \_\_\_\_\_  meters  feet
- IV. Screen length                              \_\_\_\_\_  meters  feet
- V. Length of casing                              \_\_\_\_\_  meters  feet
- VI. Casing diameter                              \_\_\_\_\_  meters  feet

3.3d. Material used to seal the casing

- cement-bentonite
- bentonite
- other \_\_\_\_\_

3.3e. Depth of pump at time of drilling

\_\_\_\_\_  meters  feet

3.3f. Has the depth of the pump been altered since it was first installed?

- yes, it was raised
- yes, it was lowered
- no, never changed
- do not know

3.3g. Static level at time of drilling

\_\_\_\_\_  meters  feet

3.3h. Flow rate at time of drilling

- \_\_\_\_\_  cubic meters/hour
- \_\_\_\_\_  gallons/hour
- \_\_\_\_\_  litres/min
- \_\_\_\_\_  gallons/min

**3.4 If you use a well, what maintenance, retrofitting or repair has been performed on the well? Please check off the appropriate options and indicate the frequency and when the work was done.**

Type of maintenance/repair:	# of times in last 20 years (frequency)	Most recent year
<input type="radio"/> Disinfection or shocking of well	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Disinfection of waterlines and plumbing	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Hydrofracturing	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Repair of waterline leak	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Landscaping to eliminate pooling of water around the well	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Replaced the pump	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> pump raised	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> pump lowered	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Drilled the well deeper	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago
<input type="radio"/> Other, Please specify: _____ _____	<input type="radio"/> once <input type="radio"/> several times <input type="radio"/> many times <input type="radio"/> every year	<input type="radio"/> this year <input type="radio"/> last year <input type="radio"/> 2-5 years ago <input type="radio"/> 5-10 years ago <input type="radio"/> more than 10 years ago

### Section 3.5: Water shortages

The questions in this section are designed to provide information about the history of water shortages *for this water source*.

3.5a Have you experienced any water shortages so far during 2005?  
 Yes  No

**3.5b If yes, please check off during which season(s) and the frequency and duration of the shortages ?**

*Please include any additional information regarding experienced water shortages in the comments section at the end of the survey.*

Season	Month	Duration of shortage (Number of hours or days)	Frequency of Shortages (times/month)
<input type="radio"/> Winter	<input type="radio"/> December <input type="radio"/> January <input type="radio"/> February <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Spring	<input type="radio"/> March <input type="radio"/> April <input type="radio"/> May <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Summer	<input type="radio"/> June <input type="radio"/> July <input type="radio"/> August <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Fall	<input type="radio"/> September <input type="radio"/> October <input type="radio"/> November <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know

3.6a Did you experience any water shortages during 2004?

- Yes  No

3.6b If yes, please check off during which season(s) and the frequency and duration of the shortages ?

Season	Month	Duration of shortage (Number of hours or days)	Frequency of Shortages (times/month)
<input type="radio"/> Winter	<input type="radio"/> December <input type="radio"/> January <input type="radio"/> February <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Spring	<input type="radio"/> March <input type="radio"/> April <input type="radio"/> May <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Summer	<input type="radio"/> June <input type="radio"/> July <input type="radio"/> August <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know
<input type="radio"/> Fall	<input type="radio"/> September <input type="radio"/> October <input type="radio"/> November <input type="radio"/> Don't know	<input type="radio"/> Several hours <input type="radio"/> Several hours to a day <input type="radio"/> Several days <input type="radio"/> More than a week <input type="radio"/> Don't know	<input type="radio"/> Once <input type="radio"/> 2-5 <input type="radio"/> More than 5 <input type="radio"/> Don't know

3.7 Do you recall any water shortage(s) before 2004?

- More than a couple of times a year  
 Once or twice a year  
 Never  
 I don't remember

(b) insufficient water from the original water source

- Yes  No

(c) Other

Please specify: \_\_\_\_\_

3.8 Have you ever installed an additional water source (i.e. drilled a second well, or installed an intake from a lake or river) because of:

(a) poor water quality of the original water source

- Yes  No

## Section 4: Indoor Water Use

4.1 Please check indicate the number of appliances of each kind in your house and the number of times the appliances are used during an average week.

Appliance	Quantity	Times used/week
<input type="radio"/> Shower		<input type="radio"/> 1 to 10 <input type="radio"/> 11 to 20 <input type="radio"/> 21 to 30 <input type="radio"/> 31 or more
<input type="radio"/> Flushing toilet		<input type="radio"/> 1 to 25 <input type="radio"/> 26 to 50 <input type="radio"/> 51 to 75 <input type="radio"/> 76 to 100 <input type="radio"/> more than 100
<input type="radio"/> Bathtub		<input type="radio"/> 1 to 5 <input type="radio"/> 6 to 10 <input type="radio"/> 11 to 20 <input type="radio"/> 21 or more
<input type="radio"/> Dishwasher		<input type="radio"/> 1 or 2 <input type="radio"/> 3 or 4 <input type="radio"/> 5 or 6 <input type="radio"/> 7 or 8 <input type="radio"/> more than 8
<input type="radio"/> Washing machine		<input type="radio"/> 1 or 2 <input type="radio"/> 3 or 4 <input type="radio"/> 5 or 6 <input type="radio"/> 7 or 8 <input type="radio"/> more than 8
<input type="radio"/> Other <i>specify</i> _____		<input type="radio"/> 1 or 2 <input type="radio"/> 3 or 4 <input type="radio"/> 5 or 6 <input type="radio"/> 7 or 8 <input type="radio"/> more than 8

## Section 5: Outdoor Water Use

5.1 Do you have any of the following pools or gardens?

- Outdoor above-ground pool
- Outdoor in-ground pool
- Indoor swimming pool    Hot tub/whirlpool
- Greenhouse    Fountain    Water garden
- Other Please specify \_\_\_\_\_

5.2 How often are each of the following washed?

- Walkways:  Once/week or More    Every other week  
 Once/month or less    Never
- Driveway:  Once/week or More    Every other week  
 Once/month or less    Never
- Véhicles :  6 or more times/year    3 to 5 times/yr  
 Once or twice/yr    Never

Other Please specify:  
\_\_\_\_\_

5.3 My property includes (please check all that apply).

- lawns    flower gardens    vegetable gardens

5.4 During a typical summer season, how frequently do you irrigate(water) your lawn using water from your well(s)

- Never (skip to 6.1)
- Only when the ground is very dry
- Less than once a week
- 1 – 3 times a week
- 4 – 6 times a week
- Daily

5.5 During a typical summer season, how frequently do you irrigate(water) your flower gardens using water from your well(s)

- Never (skip to 6.1)
- Only when the ground is very dry
- Less than once a week
- 1 – 3 times a week
- 4 – 6 times a week
- Daily

5.6 During a typical summer season, how frequently do you irrigate(water) your vegetable gardens using water from your well(s)

- Never (skip to 6.1)
- Only when the ground is very dry
- Less than once a week
- 1 – 3 times a week
- 4 – 6 times a week
- Daily

5.7 During a typical summer season, what is the average length of time per week that you would run the outdoor hose (i.e. garden hose) in order to irrigate your lawn, flower and vegetable gardens, using water from your well(s)?

- I don't irrigate with well water
- 5-10 minutes                       11-30 minutes
- 31-60 minutes                       61-120 minutes
- 121-240 minutes                       241-480 minutes
- more than 480 minutes               I don't know

5.8 What percentage (%) of your property is lawn?

- zero %
- less than 10%
- 10–30 %
- 30–50 %
- 50–75 %
- more than 75%

5.9 What percentage (%) of your property are flower gardens?

- zero %
- less than 10%
- 10–30 %
- 30–50 %
- 50–75 %
- more than 75%

5.10 What percentage (%) of your property are vegetable gardens?

- zero %
- less than 10%
- 10–30 %
- 30–50 %
- 50–75 %
- more than 75%

5.11 Do you use any of the following alternate sources for irrigation water?

Please check all that apply.

- No
- Nearby surface water (stream, pond, river, lake)
- Rain barrel
- Other Please specify \_\_\_\_\_

## Section 6: Personal Feedback

6.1 If the results of this survey indicate that certain areas of Chelsea have an elevated risk of water shortages, would you support water conservation bylaws (e.g. a lawn watering bylaw) in your neighborhood in order to reduce this risk ?

- very strongly support
- strongly support
- mildly support
- mildly oppose
- strongly oppose
- very strongly oppose
- neither support or oppose

6.2a Most urban residents pay for their water and have water meters to record water consumption. Would you support (in principle) a water meter pilot-project designed to determine average household consumption patterns in Chelsea (and that could help raise awareness of how households can reduce their annual water use)?

- very strongly oppose
- strongly oppose
- mildly oppose
- mildly support
- strongly support
- very strongly support
- neither support or oppose

6.2b If a water meter pilot-project was approved, would you be interested in participating (i.e. have a water meter installed on your well for the duration of the project).

- Yes
- No

6.2c If you have concerns of water in Chelsea, is it because of: please check all that apply

- concerns about drinking water quality
- concerns regarding domestic water quantity
- value of my home could be affected by water quality and/or quantity problems
- concerns regarding recreational water quality (e.g. swimming in local lakes)
- concerns regarding recreational water quantity (e.g. not enough water to fill my swimming pool)
- I do not have any significant concerns about water in Chelsea

6.2d Before this census, had you heard about the H<sub>2</sub>O Chelsea project?

- Yes
- No

6.2e On a scale of 1-7, how would you grade the H<sub>2</sub>O Chelsea project? (please circle)

1      2      3      4      5      6      7  
(1= not worthwhile) (7= excellent, very worthwhile)

***If you have any questions, comments, or concerns please include them below.***