



## Introduction

Version 1.0 - March 2012

### What Is the GEMI Local Water Tool™ for Oil and Gas?

The GEMI Local Water Tool™ (LWT™) for Oil and Gas is a free tool developed by a group of 40+ global companies to help them and other companies identify the external impacts, business risks, and opportunities related to water use and discharge at a specific site or operation. The information generated in the GEMI LWT™ for Oil and Gas may be used by companies and organizations for developing management plans and communicating outcomes at their discretion.

### What Does It Do?

The GEMI LWT™ for Oil and Gas:

- Helps companies assess external impacts, business risks, opportunities and manage water-related issues at specific sites
- Provides a common and consistent visualization platform for internal and external communication
- Provides interconnectivity between global and local water risk assessments and a uniform approach between site assessments
- Provides a central repository of information to create reports for internal and external stakeholders.

### Who is it For?

Oil and Gas companies who wish to evaluate water-related external impacts, business risks and sufficiency of management plans at specific sites.

### Who Developed the Tool and How?

The Global Environmental Management Initiative ([www.gemi.org](http://www.gemi.org)) and a group of non-member GEMI LWT™ Project Participant companies developed the GEMI LWT™ for Oil and Gas to expand the information and learning's of GEMI's two existing water sustainability solution tools, **Connecting the Drops** (2002) and **Collecting the Drops** (2007). The GEMI LWT™ was developed in cooperation with the World Business Council for Sustainable Development ([www.wbcsd.org](http://www.wbcsd.org)) to link to the IPIECA Global Water Tool (GWT) for Oil and Gas and provide the full suite of tools that companies need to sustainably manage water in their operations. The GEMI LWT™ for Oil and Gas and IPIECA GWT for Oil and Gas are designed to fully be compatible to enable users to achieve full value from use of both tools. CH2M HILL ([www.ch2m.com](http://www.ch2m.com)) assisted in the development of the GEMI LWT™ for Oil and Gas.

### How Does the GEMI LWT™ for Oil and Gas link with the IPIECA GWT for Oil and Gas?

Companies can employ the IPIECA GWT for Oil and Gas to identify and prioritize high risk sites in their portfolios. Companies can then employ the GEMI LWT™ for Oil and Gas to further evaluate the high risk locations and identify actions to manage the risks. An option is provided in the GEMI LWT™ for Oil and Gas to enable the user to transfer specific site data from the IPIECA GWT for Oil and Gas. The purpose and functionality of each tool are mutually supportive. The tools share the same terminology.

### GEMI Members

- |                              |                     |                           |                              |
|------------------------------|---------------------|---------------------------|------------------------------|
| • 3M                         | • ConAgra Foods     | • Johnson Controls, Inc.  | • Procter & Gamble Company   |
| • Abbott                     | • ConocoPhillips    | • Kraft Foods, Inc.       | • Perdue Family of Companies |
| • Ashland, Inc.              | • CSX               | • Halliburton             | • Scotts Miracle-Gro         |
| • Biogen Idec                | • DuPont            | • Legrand                 | • Sealed Air Corporation     |
| • BNSF Railway Company       | • Eni S.p.A         | • MedImmune               | • Smithfield Foods, Inc.     |
| • Cargill, Inc.              | • FedEx Corporation | • Merck & Company, Inc.   | • Southern Company           |
| • Carnival Corporation & plc | • Johnson & Johnson | • Occidental Petroleum Co | • Union Pacific Railroad     |

### LWT Project Participants

- |                                 |                           |                   |                         |
|---------------------------------|---------------------------|-------------------|-------------------------|
| • AkzoNobel                     | • Exxon Mobil Corporation | • Maersk Oil      | • Statoil               |
| • BP                            | • Greif                   | • Nexen Inc.      | • Suncor Energy Inc.    |
| • Chesapeake Energy Corporation | • Intel                   | • Repsol YPF S.A. | • Talisman Energy, Inc. |
| • Chevron                       | • ITT                     | • Shell           | • TOTAL                 |

### Feedback is Welcomed

GEMI welcomes feedback on the use and value of this tool to your organization.  
Please send feedback to [info@gemi.org](mailto:info@gemi.org)



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## Site Map

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Site Name:	ABC		
Address:			
City:			
Postal Code:		Operation Type:	Petrochemical
Country	United States of America		
Year:			
Latitude:	33.7514861		
Longitude:	-117.7549295		

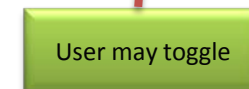
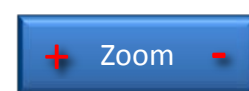
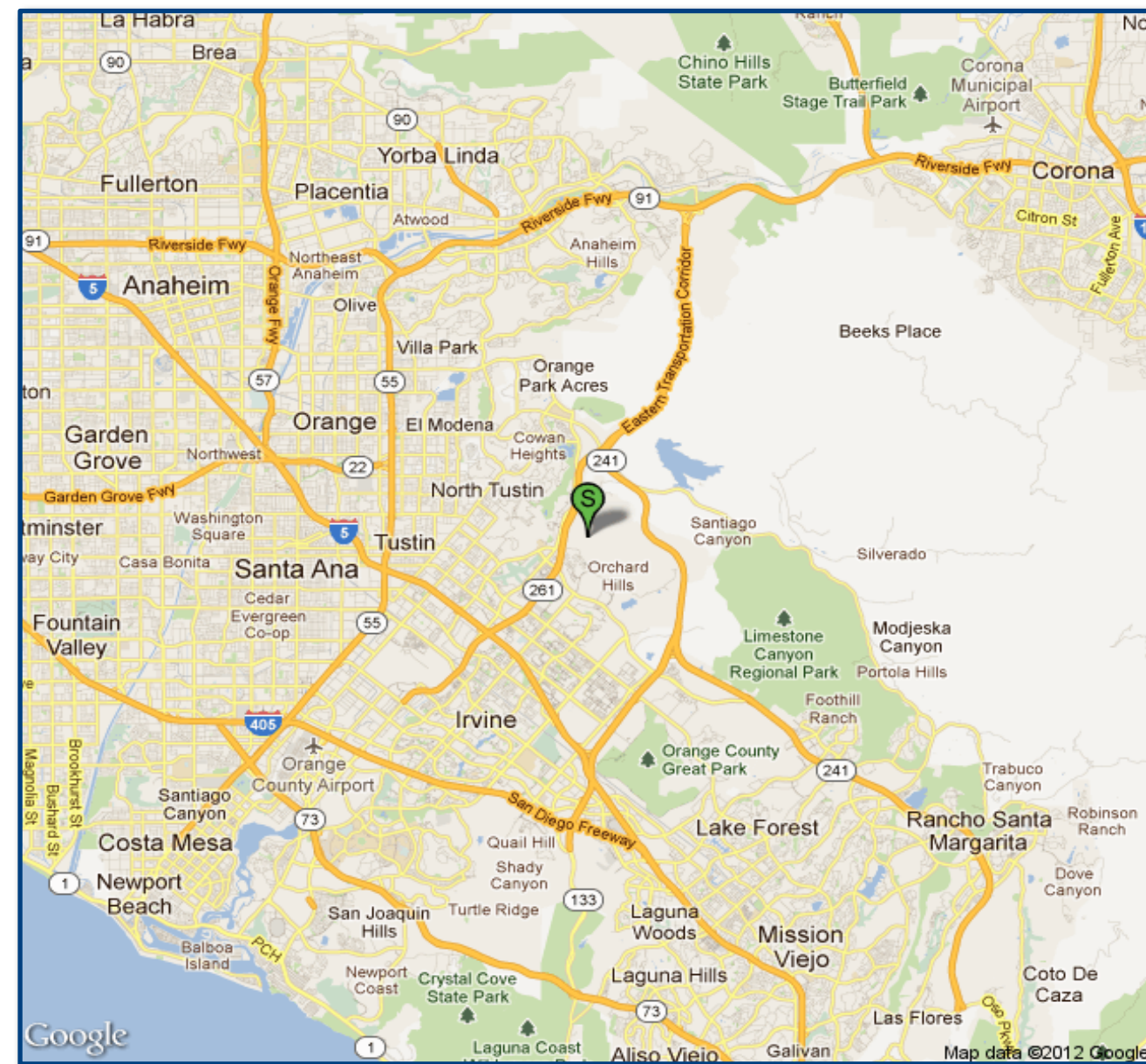
Get Map

Get Geo Code

Comments:

User Provided Site Map

- 1 Insert your map image (jpeg or others) in the window provided below by using the "Insert Picture" function on your toolbar.
- 2 Once you paste your map, resize to fit the window.



The mapping function may not work with all computer system configurations or if accessed from outside the US. If an error is generated, the User may enter their own map in the space

Insert your image here



## Setup

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### Select Data Source

Select a method to enter site influent and effluent data and click **Ok**.

- ☒ Enter data manually at site level
- ☐ Enter data manually at process level
- ☐ Import data from the IPIECA GWT for Oil and Gas

Ok

Please choose the data entry option carefully. Note that once you select a data entry option, enter your influent and effluent water data and click **Run Module Setup** on the **Home** page, then all of the fields in **Modules 2 through 6** are created. If you decide to change your data entry option or add or remove water sources or discharge points, then you must click on **Run Module Setup** again and this time your previously entered data in **Modules 2 – 6** will be erased.



IPIECA Global Water Tool (GWT) Input

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Data from the IPIECA GWT for Oil and Gas for this site is shown on this sheet if the User selected this data entry option on the **Setup** sheet.

Water Data

Site Water Inventory

Water Withdrawal Freshwater Sources	Surface	m3/year	
	Groundwater	m3/year	
	Municipal/Potable Water	m3/year	
	External Wastewater	m3/year	
	Rainwater/Precipitation	m3/year	
	Owned Produced Water	m3/year	
	<i>Mine Dewatering (see note)</i>	m3/year	
Water Withdrawal Non-Freshwater Sources	Ocean	m3/year	
	Surface (Other than Ocean)	m3/year	
	Groundwater	m3/year	
	External Wastewater	m3/year	
	Owned Produced Water	m3/year	
	<i>Mine Dewatering (see note)</i>	m3/year	
Water Discharge Freshwater Discharge by Receiving Body	Ocean	m3/year	
	Surface	m3/year	
	Subsurface/Well	m3/year	
	Off-Site Water Treatment	m3/year	
	<i>Beneficial/Other User (see note)</i>	m3/year	
	Reinjection (for Production)	m3/year	
Water Discharge Non-Freshwater Discharge by Receiving Body	Ocean	m3/year	
	Surface	m3/year	
	Subsurface/Well	m3/year	
	Off-Site Water Treatment	m3/year	
	<i>Beneficial/Other User (see note)</i>	m3/year	
	Reinjection (for Production)	m3/year	
Recycling or Reuse	Recycling	m3/year	
	Reused	m3/year	

Site Watershed Information


WRI	Annual Renewable Water Supply per Person (1995)	(m³/person/year)	
	Annual Renewable Water Supply per Person (Projections for 2025)	(m³/person/year)	
UNH	Mean Annual Relative Water Stress Index (2000)	(Unit less)	

**Influent Sources:** Note that the Mine Dewatering category is not included in Module 1\_Influent Data. The User must choose another category (such as groundwater) and manually enter the volumes.

**Discharges:** Note that the Beneficial/Other User category is not included in Module 1\_Effluent Data. The User must choose another category (such as Surface Water) and manually enter the volumes.

Country Information

FAO AQUASTAT	Total Internal Renewable (IRWR)(2006)	(10^9 m3/year)	
	Total Internal Renewable per capita (IRWR/Capita)(2008)	(m3/person/year)	
	Total External (actual)(ERWR) (2006)	(10^9 m3/year)	
	Total Renewable (actual) (TRWR)(2006)	(10^9 m3/year)	
	Total Renewable per capita (TRWR/Capita)(2008)	(m3/person/year)	
	Total Renewable per capita (TRWR/Capita) (2025)	(m3/person/year)	
	Total Renewable per capita (TRWR/Capita) (2050)	(m3/person/year)	
	Dependency Ratio (2006)	(%)	
	Agricultural water withdrawal as part of total (Around 2002)	(%)	
	Municipal water withdrawal as part of total (Around 2002)	(%)	
	Industrial water withdrawal as part of total (Around 2002)	(%)	
	Total water withdrawal: per person (Around 2002)	(m3/person/year)	
	Total freshwater withdrawal (surface + gw)	(10^9 m3/year)	
	Total freshwater withdrawal as % of TRWR (Around 2002)	(%)	
	Desalinated water produced (2005)	(10^9 m3/year)	
WHO/UNICEF (2008)	Population Total	number	
	Population Urban	(%)	
	Population Rural	(%)	
	Population served with improved water [Total Coverage]	(%)	
	Population served with improved water [Urban Coverage]	(%)	
	Population served with improved water [Rural Coverage]	(%)	
	Population served with improved sanitation [Total Coverage]	(%)	
	Population served with improved sanitation [Urban Coverage]	(%)	
	Population served with improved sanitation [Rural Coverage]	(%)	
	Population served with improved sanitation [Rural Coverage]	(%)	
UN - ESA, Population Div.	Urban Annual Growth Rate (2010-2015)	(%)	



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Module 1: Influent Data

Click the **Less/More** Buttons to hide or

If changes are made to numerical data or process names in the Module 1 Influent and Effluent Data sheets, then you must go back to

Choose Units

m3/year

Please enter the names of all Influent Sources carefully in **Freshwater and Non-Freshwater** categories as applicable. Note that once you select a data entry option, enter your influent water data and click **Run Module Setup** on the **Home** page then all of the fields in **Modules 2 through 6** are created. If you decide to change your data entry option or add or remove water sources or discharge points, then you must click on **Run Module Setup** again and your previously entered data in **Modules 2 – 6** will be erased. The volume and quality data may be adjusted later in this sheet, but the names of the Influent Sources may not.

Site/Process Name	Water Withdrawal Freshwater Sources																	
	Surface Water No. 1						Groundwater No. 1						Municipal/Potable Water No. 1					
	Volume	Unit	Name of Surface Water Body	Withdrawal Quality			Volume	Unit	Name of Groundwater Body	Withdrawal Quality			Volume	Unit	Name of Supplier	Withdrawal Quality		
				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)
Site Level Data (New Data Entry)																		
ABC	10,000	m3/year	River A					m3/year					m3/year					

GEMI Oil\_Gas\_LWT\_Final.xlsm-Module 1\_Influent Data

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Module 1: Influent Data

Choose Units

Site/Process Name															Water Withdrawal Non-Freshwater Sources		
	External Wastewater No. 1						Owned Produced Water						Rainwater/ Precipitation		Ocean		
	Volume	Unit	Name of Supplier	Withdrawal Quality			Volume	Unit	Name of Reservoir/ Well	Withdrawal Quality			Volume	Unit	Volume	Unit	Name of Ocean
				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)					
Site Level Data (New Data Entry)																	
ABC		m3/year						m3/year						m3/year		m3/year	



## Module 1: Influent Data

Choose Units

Site/Process Name																			
				Surface Water (other than Ocean) No. 1						Groundwater No. 1						External Wastewater No. 1			
	Withdrawal Quality			Volume	Unit	Name of Surface Water	Withdrawal Quality			Volume	Unit	Name of Groundwater Source	Withdrawal Quality			Volume	Unit	Name of External Wastewater Source	With
	TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)
Site Level Data (New Data Entry)																			
ABC					m3/year					m3/year						m3/year			



Module 1: Influent Data

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Choose Units

Site/Process Name									Internal Recycled/Reused				Total Site/Facility Production	Total Production Unit	Total Site/Facility Revenue	Comments
	<div>more</div>		Owned Produced Water						Recycled		Reused					
	Withdrawal Quality		Volume	Unit	Name of Reservoir/ Well	Withdrawal Quality			Volume	Unit	Volume	Unit				
	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)					unit/year	unit	\$/year	
Site Level Data (New Data Entry)																
ABC				m3/year						m3/year		m3/year				

Module 1: Effluent Data

Click the **Less/More** Buttons to hide or view

If changes are made to numerical data or process names in the Module 1 Influent and Effluent Data sheets, then you must go

Please enter the names of all Effluent Discharge Points carefully in **Freshwater and Non-Freshwater** categories as **applicable**. Note that once you select a data entry option, enter your effluent water data and click **Run Module Setup** on the **Home** page, then all of the fields in **Modules 2 through 6** are created. If you decide to change your data entry option or add or remove water sources or discharge points, then you must click on **Run Module Setup** and your previously entered data in **Modules 2 – 6** will be erased. The volume and quality data may be adjusted later in this sheet, but the names of the Effluent Discharge Points may not.

Site/Process Name	Water Discharge Freshwater Discharge by Receiving Waterbody or Entity																	
	Ocean					Surface Water No. 1 <div>more</div>							Subsurface No. 1 <div>more</div>					
	Volume	Unit	Name of Ocean	Discharge Quality			Volume	Unit	Name of Surface Water	Discharge Quality			Volume	Unit	Name of Subsurface Unit	Discharge Quality		
				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)
Site Level Data (New Data Entry)																		
ABC		m3/year					m3/year					m3/year						



Module 1: Effluent Data

Site/Process Name													Water Discharge Non-Freshwater Discharge by Receiving Waterbody or Entity					
	Offsite Treatment Plant No. 1 <div>more</div>						Reinjection (for Production)						Ocean					
	Volume	Unit	Name of Treatment Plant	Discharge Quality			Volume	Unit	Name of Reservoir/Well	Discharge Quality			Volume	Unit	Name of Ocean	Discharge Quality		
				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)
Site Level Data (New Data Entry)																		
ABC	5,000	m3/year	Treatment Plant A					m3/year					m3/year					



Module 1: Effluent Data

Site/Process Name																		
	Surface Water No. 1						Subsurface 1						Offsite Treatment Plant No. 1					
	Volume	Unit	Name of Surface Water	Discharge Quality			Volume	Unit	Name of Subsurface Unit	Discharge Quality			Volume	Unit	Name of Treatment Plant	Discharge Quality		
				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)
Site Level Data (New Data Entry)																		
ABC		m3/year						m3/year					m3/year					



Module 1: Effluent Data

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Site/Process Name							Comments
	Reinjection (for Production)						
	Volume	Unit	Name of Treatment Plant	Discharge Quality			
				TDS (mg/L)	COD (mg/L)	TPH (tons/yr)	
Site Level Data (New Data Entry)							
ABC		m3/year					



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## Module 1: Site Output

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This sheet is populated when the User clicks **Run Module Setup** on the **Home** Page.

**Notes:**  
If there are two different (fresh and nonfresh) discharges to the same Receiving Waterbody or entity, then the Receiving Waterbody or entity will be listed twice. Each discharge potentially has unique impacts and risks associated with it. Water Sources and Discharge Points with

A detailed definition of the internal importance level is available in "**Droplist - Module 1**" Worksheet. Please click on the button shown on the right to access the page with the detailed definitions.

Droplist - Module 1

Water Source or Discharge Point	Volume m3/year	Internal Importance Level (0-3)		User Comments
		Select Level	Definition	
Influent Source	Water Withdrawal			
River A	10,000	2	Medium – Alternative Requires Extra Cost and Time to Implement	
Receiving Waterbody/Entity	Water Discharge			
Treatment Plant A	5,000	3	High – No Alternative, High Cost or Long Timeframe.	



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## Module 2: Local External Conditions - Influent Source

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The **External Stress Severity Level** describes the current conditions of a specific water source. The External Stress Severity Level is selected by the User for specific issues on each water source through review of external data sources and by best professional judgment. The External Stress Severity Level is a result of natural physical conditions and cumulative anthropogenic (human, industry, agriculture) impacts. The External Stress

A detailed definition of the External Stress Severity Level is available in "[Droplist - Module 2](#)" Worksheet. Please click on the button shown on the right to access the page with the detailed definitions. In addition, click on the specific issues in the "**Issues**" column that are hyperlinked to Droplist-Module

[Droplist - Module 2](#)

[Data Source List](#)

Issues	External Data		External Stress Severity Level		User Comments
	Data	Source of Data	Select Level	Definition	
River A					
Physical Source Characteristics (Current)					
<a href="#">Availability</a>			2	Medium – water source in equilibrium with water needs	
<a href="#">Quality</a>			2	Medium – moderate levels of water quality stress	
<a href="#">Drought patterns</a>			3	High – drought-caused stress common within 5 years	
Physical Supply Reliability (Future)					
<a href="#">Agricultural and livestock demand pattern</a>			1	Low – near constant	
<a href="#">Population growth</a>			1	Low – near constant population or slow growth	
<a href="#">Industrial growth</a>			2	Medium – moderate growth	
<a href="#">Oil and Gas Industry Growth</a>			3	High - significant growth and competition	



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Optional Data Entry Field

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Required Data Entry Field

## Module 2: Local External Conditions - Influent Source

Version 1.0 - March 2012

The **External Stress Severity Level** describes the current conditions of a specific water source. The External Stress Severity Level is selected by the User for specific issues on each water source through review of external data sources and by best professional judgment. The External Stress Severity Level is a result of natural physical conditions and cumulative anthropogenic (human, industry, agriculture) impacts. The External Stress

A detailed definition of the External Stress Severity Level is available in "[Droplist - Module 2](#)" Worksheet. Please click on the button shown on the right to access the page with the detailed definitions. In addition, click on the specific issues in the "**Issues**" column that are hyperlinked to Droplist-Module

[Droplist - Module 2](#)

[Data Source List](#)

Issues	External Data		External Stress Severity Level		User Comments
	Data	Source of Data	Select Level	Definition	
<a href="#">Electrification Growth</a>			3	High – significant growth and competition	
<a href="#">Projected impacts of climate change</a>			2	Medium – moderately less precipitation	
<b>Ecosystems</b>					
<a href="#">Local ecosystems</a>			1	Low – no or minimal levels of local ecosystem stress	
<a href="#">Watershed ecosystems</a>			2	Medium – moderate levels of watershed ecosystem stress	
<b>Regulatory</b>					
<a href="#">Current regulatory</a>			2	Medium – moderate difficulty of current issues	
<a href="#">Potential regulatory</a>			3	High – significant difficulty of potential issues	
<b>Economics</b>					
<a href="#">Delivered costs</a>			2	Medium – moderate delivery costs but not expected to change	



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Required Data Entry Field

## Module 2: Local External Conditions - Influent Source

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The **External Stress Severity Level** describes the current conditions of a specific water source. The External Stress Severity Level is selected by the User for specific issues on each water source through review of external data sources and by best professional judgment. The External Stress Severity Level is a result of natural physical conditions and cumulative anthropogenic (human, industry, agriculture) impacts. The External Stress

A detailed definition of the External Stress Severity Level is available in "[Droplist - Module 2](#)" Worksheet. Please click on the button shown on the right to access the page with the detailed definitions. In addition, click on the specific issues in the "**Issues**" column that are hyperlinked to Droplist-Module

[Droplist - Module 2](#)

[Data Source List](#)

Issues	External Data		External Stress Severity Level		User Comments
	Data	Source of Data	Select Level	Definition	
<a href="#">Treatment costs</a>			3	High – major new capital facility or treatment costs forecast	
<b>Social Context</b>					
<a href="#">Local reputation</a>			2	Medium – community action and negative media on environmental issues	
<a href="#">Social activism</a>			3	High –national or global water-related campaign –past or current	
<a href="#">Availability and quality of water for human needs</a>			3	High – community has low access to improved supply or regular interruptions	
<a href="#">Availability of water for local food supply</a>			2	Medium – community dependent on local food supply which is not limited by water	



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Required Data Entry Field

## Module 2: Local External Conditions - Effluent Receiving Waterbody or Entity

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The **External Stress Severity Level** describes the current conditions of a specific receiving waterbody or entity. The External Stress Severity Level is selected by the User for specific issues on each water source through review of external data sources and by best professional judgment. The External Stress Severity Level is a result of natural physical conditions and cumulative anthropogenic (human, industry, agriculture) impacts. The External Stress Severity Level for each issue is rated by the User as either 0 (none), if applicable; 1 (low); 2 (medium); or 3 (high).

If there are two different (fresh and nonfresh) discharges to the same Receiving Waterbody/Entity, then the Receiving Waterbody/Entity will be listed twice. Each discharge potentially has unique impacts and risks associated with it.

A detailed definition of the External Stress Severity Level is available in "[Droplist - Module 2](#)" Worksheet. Please click on the button shown on the right to access the page with the detailed definitions. In addition, click on the specific issues in the "**Issues**" column that are hyperlinked to Droplist-Module 2 Worksheet.

[Droplist - Module 2](#)

[Data Source List](#)

Issues	External Data		External Stress Severity Level		User Comments
	Data	Source of Data	Select Level	Definition	
Treatment Plant A					
Physical Receiving Entity Characteristics (Current)					
<a href="#">Capacity</a>			3	High – capacity limited or exceeded	
<a href="#">Quality</a>			2	Medium – moderate levels of water quality stress	
Physical Ability to Discharge (Future)					
<a href="#">Agricultural and livestock demand pattern</a>			2	Medium – moderate growth	
<a href="#">Population growth</a>			1	Low – near constant population or slow growth	
<a href="#">Industrial growth</a>			2	Medium – moderate growth	
<a href="#">Oil and Gas Industry Growth</a>			3	High - significant growth and competition	
<a href="#">Electrification growth</a>			2	Medium – moderate growth	



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Required Data Entry Field

## Module 2: Local External Conditions - Effluent Receiving Waterbody or Entity

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The **External Stress Severity Level** describes the current conditions of a specific receiving waterbody or entity. The External Stress Severity Level is selected by the User for specific issues on each water source through review of external data sources and by best professional judgment. The External Stress Severity Level is a result of natural physical conditions and cumulative anthropogenic (human, industry, agriculture) impacts. The External Stress Severity Level for each issue is rated by the User as either 0 (none), if applicable; 1 (low); 2 (medium); or 3 (high).

If there are two different (fresh and nonfresh) discharges to the same Receiving Waterbody/Entity, then the Receiving Waterbody/Entity will be listed twice. Each discharge potentially has unique impacts and risks associated with it.

A detailed definition of the External Stress Severity Level is available in "[Droplist - Module 2](#)" Worksheet. Please click on the button shown on the right to access the page with the detailed definitions. In addition, click on the specific issues in the "**Issues**" column that are hyperlinked to Droplist-Module 2 Worksheet.

[Droplist - Module 2](#)

[Data Source List](#)

Issues	External Data		External Stress Severity Level		User Comments
	Data	Source of Data	Select Level	Definition	
<a href="#">Projected impacts of climate change</a>			3	High – significantly less precipitation	
<b>Ecosystems</b>					
<a href="#">Local ecosystems</a>			2	Medium – moderate levels of local ecosystem stress	
<a href="#">Watershed ecosystems</a>			3	High – substantial levels of watershed ecosystem stress	
<b>Regulatory</b>					
<a href="#">Current regulatory</a>			2	Medium – moderate difficulty of current issues	
<a href="#">Potential regulatory</a>			3	High – significant difficulty of potential issues	
<b>Economics</b>					
<a href="#">Discharge costs</a>			2	Medium – moderate discharge costs but not expected to change	
<a href="#">Treatment costs</a>			2	Medium – multistage treatment required but not expected to change	



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Optional Data Entry Field

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Required Data Entry Field

## Module 2: Local External Conditions - Effluent Receiving Waterbody or Entity

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The **External Stress Severity Level** describes the current conditions of a specific receiving waterbody or entity. The External Stress Severity Level is selected by the User for specific issues on each water source through review of external data sources and by best professional judgment. The External Stress Severity Level is a result of natural physical conditions and cumulative anthropogenic (human, industry, agriculture) impacts. The External Stress Severity Level for each issue is rated by the User as either 0 (none), if applicable; 1 (low); 2 (medium); or 3 (high).

If there are two different (fresh and nonfresh) discharges to the same Receiving Waterbody/Entity, then the Receiving Waterbody/Entity will be listed twice. Each discharge potentially has unique impacts and risks associated with it.

A detailed definition of the External Stress Severity Level is available in "[Droplist - Module 2](#)" Worksheet. Please click on the button shown on the right to access the page with the detailed definitions. In addition, click on the specific issues in the "**Issues**" column that are hyperlinked to Droplist-Module 2 Worksheet.

[Droplist - Module 2](#)

[Data Source List](#)

Issues	External Data		External Stress Severity Level		User Comments
	Data	Source of Data	Select Level	Definition	
Social context					
<a href="#">Local reputation</a>			2	Medium – community action and negative media on environmental issues	
<a href="#">Social activism</a>			2	Medium – multiple national or global environmental campaigns	
<a href="#">Availability and quality of water for human needs</a>			2	Medium – community has incomplete access to improved supply or interruptions during dry	
<a href="#">Availability of water for local food supply</a>			2	Medium – community dependent on local food supply which is not limited by water	



Blue Colored Cell -  
Optional Data Entry Field

Light Red Colored Cell -  
Required Data Entry Field

Module 3: External Impacts - Influent Source

Version 1.0 - March 2012

A company’s individual impact on a particular water source is defined as the extent to which the volume and/or quality of water used by a company in a specific watershed affects the availability of water for other uses or harms health or ecosystems in any other way.

The level of a company’s individual impact on a particular water source is defined by applying a **Magnitude of Company Contribution Factor** to the External Stress Severity Level. In this manner, the Company’s relative contribution to the current condition of the water source can be defined. This approach enables identification and comparison of relative levels of impacts at site level.

A detailed definition of the Magnitude of Company Contribution is available in "[Droplist - Module 3](#)" Worksheet. Please click on the button shown below to access the page with the detailed definitions.

Droplist - Module 3

Water Source	External Impact Issues	External Stress Severity Level (0-3)		Magnitude of Company Contribution (0-3)		External Impact Level (0-9)	User Comments
		(from Module 2)		Select Level	Definition		
River A	Physical Source Characteristics (Current)						
	Impact on availability of water source	2	Medium – water source in equilibrium with water needs	2	Medium – water use is similar to others in the area.	4	
	Impact on quality of water source	2	Medium – moderate levels of water quality stress	1	Minimal – insignificant use of water compared to other users.	2	
	Ecosystems						
	Impact on local ecosystem	1	Low – no or minimal levels of local ecosystem stress	3	High – water use is one of largest in area.	3	
	Social Context						
	Impact on availability and quality of water for human needs	3	High – community has low access to improved supply or regular interruptions	2	Medium – water use is similar to others in the area.	6	
	Impact on availability of water for local food supply	2	Medium – community dependent on local food supply which is not limited by water	3	High – water use is one of largest in area.	6	



Blue Colored Cell -  
Optional Data Entry Field

Light Red Colored Cell -  
Required Data Entry Field

## Module 3: External Impacts - Effluent Receiving Waterbody or Entity

Version 1.0 - March 2012

A company's individual impact on a particular receiving waterbody or entity is defined as the extent to which the volume and/or quality of water discharged by a company in a specific watershed affects the availability of water for other uses or harms health or ecosystems in any other way.

The level of a company's individual impact on a particular receiving waterbody or entity is defined by applying a **Magnitude of Company Contribution Factor** to the External Stress Severity Level. In this manner, the Company's relative contribution to the current condition of the receiving waterbody or entity can be defined. This approach enables identification and comparison of relative levels of impacts at site level.

A detailed definition of the Magnitude of Company Contribution is available in "[Droplist - Module 3](#)" Worksheet. Please click on the button shown below to access the page with the detailed definitions.

[Droplist - Module 3](#)

If there are two different (fresh and nonfresh) discharges to the same Receiving Waterbody/Entity, then the Receiving Waterbody/Entity will be listed twice. Each discharge potentially has unique impacts and risks associated with it.

Discharge Point	External Impact Issues	External Stress Severity Level (0-3)		Magnitude of Company Contribution (0-3)		External Impact Level (0-9)	User Comments
		(from Module 2)		Select Level	Definition		
Treatment Plant A	Physical Source Characteristics (Current)						
	Impact on capacity of receiving waterbody	3	High – capacity limited or exceeded	2	Medium – water discharge is similar to others in the area.	6	
	Impact on quality of receiving waterbody	2	Medium – moderate levels of water quality stress	2	Medium – discharge load is similar to others in the area.	4	
	Ecosystems						
	Impact on local ecosystem	2	Medium – moderate levels of local ecosystem stress	2	Medium – discharge load is similar to others in the area.	4	
	Social Context						
	Impact on availability and quality of water for human needs	2	Medium – community has incomplete access to improved supply or interruptions during dry	2	Medium – discharge load is similar to others in the area.	4	
	Impact on availability of water for local food supply	2	Medium – community dependent on local food supply which is not limited by water	3	High – discharge load is one of largest in area.	6	



Module 4: Risks - Influent Source

Version 1.0 - March 2012

A company’s risk from using water from a particular water source is defined as potential business liabilities faced by the site as a result of impacts and external water-related drivers and constraints. The level of a risk associated with a particular water source is defined for each issue by combining the Internal Importance Level of the water source with the External Stress Severity Level for each issue. In this manner, the Company’s relative risks at a specific site can be identified and compared.

Company’s Risk on Specific Water Issue for Each Source = Internal Importance Level (Module 1) X External Stress Severity Level (Module 2)

Water Source	Internal Importance Level (0-3) (from Module 1)	Potential Risk to Business	External Stress Severity Level of External Condition (0 - 3) (from Module 2)	Risk Level (Importance x Stress Severity) (0-9) (calculated value)	User Comments
River A	2	<b>Physical Source Characteristics (Current)</b>			
		Availability	2	4	
		Quality	2	4	
		Drought patterns	3	6	
		<b>Physical Supply Reliability (Future)</b>			
		Agricultural and livestock demand pattern	1	2	
		Population growth	1	2	
		Industrial growth	2	4	
		Oil and Gas Industry Growth	3	6	
		Electrification growth	3	6	
		Projected impacts of climate change	2	4	
		<b>Ecosystems</b>			
		Local ecosystems	1	2	
		Watershed ecosystems	2	4	
		<b>Regulatory</b>			
		Current regulatory	2	4	
		Potential regulatory	3	6	
		<b>Economics</b>			
		Delivered costs	2	4	
		Treatment costs	3	6	
		<b>Social Context</b>			
		Local reputation	2	4	
		Social activism	3	6	
		Availability and quality of water for human needs	3	6	
		Availability of water for local food supply	2	4	



Module 4: Risks - Effluent Receiving Waterbody or Entity

Version 1.0 - March 2012

A company’s risk from discharging to a particular receiving waterbody or entity is defined as potential business liabilities faced by the site as a result of impacts and external water-related drivers and constraints. The level of a risk associated with a particular receiving waterbody or entity is defined for each issue by combining the Internal Importance Level of the receiving waterbody or entity with the External Stress Severity Level for each issue. In this manner, the Company’s relative risks at a specific site can be identified and compared.

Company’s Risk on Specific Water Issue for Waterbody/Receiving Entity = Internal Importance Level (Module 1) X External Stress Severity Level (Module 2)

If there are two different (fresh and nonfresh) discharges to the same Receiving Waterbody/Entity, then the Receiving Waterbody/Entity will be listed twice. Each discharge potentially has

Discharge Point	Internal Importance Level (0-3) (from Module 1)	Potential Risk to Business	External Stress Severity Level of External Condition (0 - 3) (from Module 2)	Risk Level (Importance x Stress Severity) (0-9) (calculated value)	User Comments
Treatment Plant A	3	<b>Physical Receiving Entity Characteristics (Current)</b>			
		Capacity	3	9	
		Quality	2	6	
		<b>Physical Ability to Discharge (Future)</b>			
		Agricultural and livestock demand pattern	2	6	
		Population growth	1	3	
		Industrial growth	2	6	
		Oil and Gas Industry Growth	3	9	
		Electrification growth	2	6	
		Projected impacts of climate change	3	9	
		<b>Ecosystems</b>			
		Local ecosystems	2	6	
		Watershed ecosystems	3	9	
		<b>Regulatory</b>			
		Current regulatory	2	6	
		Potential regulatory	3	9	
		<b>Economics</b>			
		Discharge costs	2	6	
		Treatment costs	2	6	
		<b>Social Context</b>			
		Local reputation	2	6	
		Social activism	2	6	
		Availability and quality of water for human needs	2	6	
		Availability of water for local food supply	2	6	

Module 5: Management Plan - Influent Source

Version 1.0 - March 2012

Water Source	Internal Importance Level (0-3)  (from Module 1)	Potential Risk to Business  (from Module 4)	Risk Level (0-9)	External Impacts by Company  (from Module 3)	External Impact Level (0 - 9)	Current Management Method	Current Management Method Sufficient? (yes/no)	Action Plan	Company Priority	Time Frame for Implementation	Implementation Cost	Progress on Implementation	Positive Water Management Opportunities?
River A	2												
		Physical Source Characteristics (Current)											
		Availability	4	Impact on availability of water source	4								
		Quality	4	Impact on quality of water source	2								
		Drought patterns	6										
		Physical Supply Reliability (Future)											
		Agricultural and livestock demand pattern	2										
		Population growth	2										
		Industrial growth	4										
		Oil and Gas Industry Growth	6										
		Electrification growth	6										
		Projected impacts of climate change	4										
		Ecosystems											
		Local ecosystems	2	Impact on local ecosystem	3								
		Watershed ecosystems	4										
		Regulatory											
		Current regulatory	4										
		Potential regulatory	6										
		Economics											
		Delivered costs	4										
		Treatment costs	6										
		Social Context											
		Local reputation	4										
		Social activism	6										
		Availability and quality of water for human needs	6	Impact on availability and quality of water for human needs.	6								
		Availability of water for local food supply	4	Impact on availability of water for local food supply.	6								

Module 5: Management Plan - Effluent Receiving Waterbody or Entity

Version 1.0 - March 2012

If there are two different (fresh and nonfresh) discharges to the same Receiving Waterbody/Entity, then the Receiving Waterbody/Entity will be listed twice. Each discharge potentially has unique impacts and risks associated with it.

Discharge Point	Internal Importance Level (0-3)  (from Module 1)	Potential Risk to Business  (from Module 4)	Risk Level (0-9)	External Impacts by Company  (from Module 3)	External Impact Level (0 - 9)	Current Management Method	Current Management Method Sufficient? (yes/no)	Action Plan	Company Priority	Time Frame for Implementation	Implementation Cost	Progress on Implementation	Positive Water Management Opportunities?
Treatment Plant A	3												
		Physical Source Characteristics (Current)											
		Availability	9	Impact on capacity of receiving waterbody	6								
		Quality	6	Impact on quality of receiving waterbody	4								
		Physical Supply Reliability (Future)											
		Agricultural and livestock demand pattern	6										
		Population growth	3										
		Industrial growth	6										
		Oil and Gas Industry Growth	9										
		Electrification growth	6										
		Projected impacts of climate change	9										
		Ecosystems											
		Local ecosystem	6	Impact on local ecosystem	4								
		Watershed ecosystem	9										
		Regulatory											
		Current regulatory	6										
		Potential regulatory	9										
		Economics											
		Delivered costs	6										
		Treatment costs	6										
		Social Context											
		Local reputation	6										
		Social activism	6										
		Availability and quality of water for human needs	6	Impact on availability and quality of water for human needs.	4								
		Availability of water for local food supply	6	Impact on availability of water for local food supply.	6								



## Module 6: Internal Metrics

Version 1.0 - March 2012

If changes are made to numerical data or process names in the Module 1 Influent and Effluent Data sheets, then you must go back to the **Home** page and click **Run Internal Metrics** and **Run Reporting** to update the Internal Metrics and Reporting sheets.

[illegible]



## Module 6: Reporting

Version 1.0 - March 2012

If changes are made to numerical data or process names in the Module 1 Influent and Effluent Data sheets, then you must go back to the [Home](#) page and click [Run Internal Metrics](#) and [Run Reporting](#) to update the Internal Metrics and Reporting sheets.

[illegible]



## Dashboard

Version 1.0 - March 2012

To create a summary of high level (6-9) impacts and risks on this page, go to the **Home** page and click **Run Dashboard**. If you make changes to any of the Modules, then you must click **Run Dashboard** to revise this summary.

### Impact Summary - Influent

Water Source	External Impact Issues (from Module 3)	External Impact Level (6-9)
River A	Impact on availability and quality of water for human needs	6
River A	Impact on availability of water for local food supply	6

### Impact Summary - Effluent

Discharge Point	External Impact Issues (from Module 3)	External Impact Level
Treatment Plant A	Impact on capacity of receiving waterbody	6
Treatment Plant A	Impact on availability of water for local food supply	6

### Risk Summary - Influent

Water Source	Potential Risk to Business (from Module 4)	Risk Level (6-9)
River A	Drought patterns	6
River A	Oil and Gas Industry Growth	6
River A	Electrification growth	6
River A	Potential regulatory	6
River A	Treatment costs	6
River A	Social activism	6
River A	Availability and quality of water for human needs	6

### Risk Summary - Effluent

Discharge Point	Potential Risk to Business (from Module 4)	Risk Level (6-9)
Treatment Plant A	Capacity	9
Treatment Plant A	Quality	6
Treatment Plant A	Agricultural and livestock demand pattern	6
Treatment Plant A	Industrial growth	6
Treatment Plant A	Oil and Gas Industry Growth	9
Treatment Plant A	Electrification growth	6
Treatment Plant A	Projected impacts of climate change	9
Treatment Plant A	Local ecosystems	6
Treatment Plant A	Watershed ecosystems	9
Treatment Plant A	Current regulatory	6
Treatment Plant A	Potential regulatory	9
Treatment Plant A	Discharge costs	6
Treatment Plant A	Treatment costs	6
Treatment Plant A	Local reputation	6
Treatment Plant A	Social activism	6
Treatment Plant A	Availability and quality of water for human needs	6
Treatment Plant A	Availability of water for local food supply	6



Droplist - Module 1

Version 1.0 - March 2012

Internal Importance Level

Module 1 - Site Output

Influent Source

Level Selected	Dropdown Definition	Full Definition
0	Produced water not used for any business purpose	An importance level of zero would apply to produced water sources that are not used for any business purpose. An importance level of zero is not allowed for any other influent source used by a site. If a source is used, it has some importance.
1	Minimal – Simple Replacement	Water from this influent source could be replaced by another source or by a zero-water process technology at minimal cost and timeframe. The alternative source has been identified and can be obtained with minimal permitting or other effort.
2	Medium – Alternative Requires Extra Cost and Time to Implement	Replacement of this influent source with another source or zero-water technology is possible but may require moderate lead time to implement. The alternative source has been identified and can be obtained with a moderate amount of effort (normal permitting process or known technology).
3	High – No Alternative, High Cost or Long Timeframe.	Replacement of this influent source would be difficult or not possible. The cost of using alternative sources or zero-water technology would likely be economically significant to the operation. The timeframe for implementation may be long . There is no obvious alternative source or significant effort would be needed to obtain water from the alternative source (such as difficult permitting process or unproven or costly technology).

Receiving Waterbody or Entity

Level Selected	Dropdown Definition	Full Definition
0	Not included	An importance level of zero is not allowed for any receiving waterbody or entity used by a site. If there is some discharge to a point, it has some importance.
1	Minimal – Simple Replacement	Discharge to this receiving waterbody or entity could be replaced by another discharge point or by a zero-water discharge technology at minimal cost and timeframe. The alternative discharge point has been identified and can be obtained with minimal permitting or other effort.
2	Medium – Alternative Requires Extra Cost and Time to Implement	Replacement of discharge to this receiving waterbody or entity to another discharge point or by a zero-water discharge technology is possible but may require moderate lead time to implement. The alternative discharge point has been identified and can be obtained with a moderate amount of effort (normal permitting process or known technology).
3	High – No Alternative, High Cost or Long Timeframe.	Replacement of discharge to this receiving waterbody or entity to another discharge point would be difficult or not possible. The cost of discharge to an alternative point or zero-water discharge technology would likely be economically significant to the operation. The timeframe for implementation may be long. There is no obvious alternative discharge point or significant effort would be needed to discharge effluent to the discharge point (such as difficult permitting process or unproven or costly technology).



## Droplist - Module 2

Version 1.0 - March 2012

### External Stress Severity Level

#### Module 2: External Local Conditions-Influent

##### Physical Source Characteristics - Availability

**Water Availability:** Water availability is defined as the hydrologic capacity of a water source (surface water body, groundwater, municipal water) to sustain additional water demands after considering other current water uses and water conditions.

##### References

UN Water for Life Decade (<http://www.un.org/waterforlifedecade/scarcity.html>). Hydrologists typically assess scarcity by looking at the population-water equation. An area is experiencing water stress when annual water supplies drop below 1,700 cubic meters(m<sup>3</sup>) per person. When annual water supplies drop below 1,000 m<sup>3</sup> per person, the population faces water scarcity, and below 500 m<sup>3</sup> "absolute scarcity". In 2011, the UN estimates that around 700 million people in 43 countries suffer today from water scarcity.

Level Selected	Dropdown Definition	Full Definition
0	Not Included	The only water source considered to have infinite availability (and therefore zero External Stress Severity Level) is seawater sourced from deep offshore locations.
1	Low – water source in abundant supply	Evidence of abundant water source: <ul style="list-style-type: none"><li>• Water availability assessment information indicates sustainable yield adequate to meet current and short term future water demands without depleting flow for existing uses</li><li>• No water shortfalls are known to occur, even during most dry periods</li></ul>
2	Medium – water source in equilibrium with water needs	Evidence of water source in equilibrium: <ul style="list-style-type: none"><li>• Water availability assessment information indicates sustainable yield adequate to meet only current water demands; additional demands in the short term future could deplete flow for other existing uses</li><li>• Water shortfalls are known to occur during dry periods</li></ul>
3	High – water source over-stressed by users	Evidence of over-stressed water source: <ul style="list-style-type: none"><li>• Water availability assessment information indicates inadequate sustainable yield to meet current and short term future water demands without depleting flow for other existing uses</li><li>• Declining groundwater levels</li><li>• Water shortfalls are known to commonly occur during dry periods</li></ul>

##### Physical Source Characteristics - Quality (same for both Influent and Effluent)

**Quality:** The quality of a specific waterbody is defined by the suitability or condition of the water for a particular use based on its physical, chemical, and biological characteristics. Most water quality stress is caused by the discharge of pollutants from human activities, including both “point” sources (such as sewer or industrial discharges, and illicit discharges) and “non-point” sources (such as runoff from urban, industrial, or agricultural lands, and septic systems). Poor water quality may threaten beneficial uses of the waterbody for such purposes as drinking water, recreation, irrigation, and the development of healthy aquatic biota (flora and fauna), and may endanger public health.

##### References:

World Bank, World Health Organization, and U.S. Geological Survey. European criteria for classification and database are available. <http://www.wiser.eu/programme-and-results/deliverables>.

Level Selected	Dropdown Definition	Full Definition
0	Not Included	Any waterbody has physical, chemical, and biological characteristics that characterize its water quality condition.
1	Low – no or minimal levels of water quality stress	Evidence of this condition: <ul style="list-style-type: none"><li>• The waterbody fully supports its beneficial uses, as compared against applicable local, national, regional, or international water quality standards/guidelines</li><li>• Water quality has been tested/analyzed and poses no known threat to public health</li><li>• If water quality has not been tested/analyzed, there is no evidence that the discharge of pollutants is impairing beneficial uses</li></ul>
2	Medium – moderate levels of water quality stress	Evidence of this condition: <ul style="list-style-type: none"><li>• The waterbody partly supports its beneficial uses, as compared against applicable local, national, regional, or international water quality standards/guidelines</li><li>• Water quality has been tested/analyzed, is impaired for some uses, but poses minor threats, if any, to public health</li><li>• If water quality has not been tested/analyzed, there is some evidence that the discharge of pollutants is impairing beneficial uses</li></ul>
3	High – substantial levels of water quality stress	Evidence of this condition: <ul style="list-style-type: none"><li>• The waterbody does not support at least one of its beneficial uses, as compared against applicable local, national, regional, or international water quality standards/guidelines</li><li>• Water quality has been tested/analyzed, is impaired, and poses known threats to public health</li><li>• If water quality has not been tested/analyzed, there is substantial evidence that the discharge of pollutants is impairing beneficial uses</li></ul>

##### Physical Source Characteristics - Drought Patterns

**Drought Pattern:** Drought can reduce water availability throughout the hydrological cycle: rivers, lakes, aquifers and reservoirs. Drought can also reduce water quality and increase temperature, because lower water flows reduce dilution of chemical constituents and thermal discharges. Increases in chemical constituent and thermal loads of remaining water sources may result.

##### References

U.S. Drought Monitor (<http://www.drought.unl.edu/dm/monitor.html>). Drought classifications (<http://www.drought.unl.edu/dm/classify.htm>)

## Droplist - Module 2

Version 1.0 - March 2012

### External Stress Severity Level

Level Selected	Dropdown Definition	Full Definition
0	None – deep seawater or non-fresh produced water	Seawater sourced from deep offshore locations is not affected by drought patterns. Non-fresh produced water sources are not affected by drought patterns.
1	Low – watershed infrequently (> 10 years) affected by drought	Existing drought patterns in local area infrequently (less than once every 10 years) cause water supply shortages, restrictions, or quality impacts in the local watershed.
2	Medium – drought-caused stress occurs every 5 to 10 years	Existing drought patterns in local area sometimes (averaging once every 5 years ) cause water supply shortages, restrictions, or quality impacts in the local watershed.
3	High – drought-caused stress common within 5 years	Existing drought patterns in local area routinely (at least once every five years) cause water supply shortages, restrictions, or quality impacts in the local watershed.

#### Physical Supply Reliability - Agriculture and Livestock Demand Patterns (same for both Influent and Effluent)

**Agricultural and Livestock Demand Pattern:** In some areas of the world, irrigation is required to grow crops. Livestock production also requires water. An increase in agricultural and livestock production activities in an area can increase water demand by that sector. Existing water users may face increased competition for water sources, higher costs or reduced allocations. An increase in agricultural and livestock production activities can also increase chemical constituent loads and reduce quality in water sources and receiving waterbodies. Reductions in the water availability and water quality in the area can affect the site’s ability to source water and discharge effluent to receiving waterbodies and entities.

##### References

3rd UN World Water Development Report: 2009 ([www.unesco.org](http://www.unesco.org)): Agriculture accounts for 70% of freshwater withdrawals from rivers, lakes and aquifers – up to more than 90% in some developing countries. Furthermore, unlike in industrial and domestic uses, where most of the water returns to rivers after use, in agriculture a large part of water is consumed by evapotranspiration. Many irrigation systems, however, return a large amount of water to the system after use. As population continues to grow and demand for food intensifies, pressure on water from agricultural activities are expected to increase, although at a slower pace. Part of the current pressure on water resources comes from increasing demands for animal feed. Meat production requires 8-10 times more water than cereal production.

Level Selected	Dropdown Definition	Full Definition
0	None – no agriculture in area or not applicable	Evidence of this condition: <ul style="list-style-type: none"><li>• There is no historical agricultural or livestock production activity in the area and no projections of activity in the future.</li><li>• Seawater sourced from and effluent discharges to deep offshore locations are not affected by agricultural or livestock production demand patterns.</li><li>• Non-fresh produced water sources are not affected by agricultural and livestock demand patterns.</li><li>• Reinjection of non-fresh produced water for production is not affected by agricultural and livestock demand patterns.</li></ul>
1	Low – near constant	Evidence of this condition: <ul style="list-style-type: none"><li>• The agricultural or livestock production activity of the local area has been essentially constant in the last five years.</li><li>• Demographic and economic projections predict near constant agricultural or livestock production activity levels in the future.</li><li>• The site has not faced competition from agriculture or livestock production for water sources.</li><li>• The site has not been affected by agricultural or livestock production water discharge.</li></ul>
2	Medium – moderate growth	Evidence of this condition: <ul style="list-style-type: none"><li>• The agricultural or livestock production activity of the local area has increased moderately in the last five years.</li><li>• Demographic and economic projections predict moderate agricultural or livestock production growth rates.</li><li>• Agriculture or livestock production is using more water in the area, but there has been no discussion of changes in allocations.</li><li>• Agriculture or livestock production is discharging more effluent in the area, but the local watershed had not been affected.</li></ul>
3	High – significant growth and competition	Evidence of this condition: <ul style="list-style-type: none"><li>• The agricultural or livestock production activity of the local area has increased significantly in the last five years.</li><li>• Demographic and economic projections predict high agricultural or livestock production growth rates.</li><li>• Agricultural or livestock production use of water is growing significantly in the area. There has been a proposal to change the site’s allocations or rates.</li><li>• Agricultural or livestock production discharges are increasing significantly in the area and the local watershed has been affected. The quality of the sources of water and the site’s ability to discharge has been affected.</li></ul>

#### Physical Supply Reliability - Population Growth (same for both Influent and Effluent)

**Population Growth:** Population growth is defined as the increase in human population number in a given geographical area over a set period of time. An increase in population in an area can increase water demand for human health, energy, industrial and agricultural needs. Existing water users may face increased competition for water sources, higher costs or reduced allocations. An increase in population can also increase chemical constituent loads and reduce quality in water sources and receiving waterbodies and entities. Reductions in the water availability and water quality in the area can affect the ability of the site to source water and discharge effluent to receiving waterbodies and entities. While a country’s population may be stagnant or even decreasing, demographic shifts within a country may cause population growth in a local area.

##### References

3rd UN World Water Development Report: 2009 ([www.unesco.org](http://www.unesco.org)): The world’s population is growing by about 80 million people a year, implying increased freshwater

## Droplist - Module 2

Version 1.0 - March 2012

### External Stress Severity Level

demand of about 64 billion cubic meters a year. An estimated 90% of the 3 billion people who are expected to be added to the population by 2050 will be in developing countries, many in regions where the current population does not have sustainable access to safe drinking water and adequate sanitation. More than 60% of the world’s population growth between 2008 and 2100 will be in sub-Saharan Africa (32%) and South Asia (30%).

Level Selected	Dropdown Definition	Full Definition
0	None – population decrease or not applicable	Evidence of this condition: <ul style="list-style-type: none"><li>• The population of the local area has decreased in the past five years.</li><li>• Demographic projections predict future declines.</li><li>• Seawater sourced from and effluent discharges to deep offshore locations are not affected by population levels.</li><li>• Non-fresh produced water sources are not affected by population growth.</li><li>• Reinjection of non-fresh produced water for production is not affected by population growth.</li></ul>
1	Low – near constant population or slow growth	Evidence of this condition: <ul style="list-style-type: none"><li>• The population of the local area has been constant or increased slightly (&lt; 1%) on annual basis in the last five years.</li><li>• Demographic projections predict near constant population levels.</li><li>• The site has not faced competition with human consumption for water sources.</li><li>• The site has not been affected by human-related discharges.</li></ul>
2	Medium – moderate growth	Evidence of this condition: <ul style="list-style-type: none"><li>• The population of the local area has increased moderately (1 – 9.9%) on annual basis in the last five years.</li><li>• Demographic projections predict moderate population growth rates.</li><li>• Human consumption of water is increasing in the area, but there has been no discussion of changes in allocations.</li><li>• Human discharges are increasing in the area, but the local watershed had not been affected</li></ul>
3	High – significant growth	Evidence of this condition: <ul style="list-style-type: none"><li>• The population of the local area has increased significantly (&gt;10%) on annual basis in the last five years.</li><li>• Demographic projections predict high population growth rates.</li><li>• Human consumption has risen significantly in the area. There has been a proposal to change the site’s allocations or rates.</li><li>• Human discharges are increasing significantly in the area and the local watershed has been affected. The quality of the sources water and the site’s ability to discharge has been affected.</li></ul>

### Physical Supply Reliability - Industrial Growth (same for both Influent and Effluent)

**Industrial Growth:** Industrial growth is defined as the increase in manufacturing-related activities in a given geographical area over a set period of time. While industries vary in water requirements, an increase in industrial activity in an area can increase that sector’s demand for water. Existing water users may face increased competition for water sources, higher costs or reduced allocations. An increase in industrial activity can also increase chemical constituent loads and reduce quality in water sources and receiving waterbodies and entities. Reductions in the water availability and water quality in the area can affect the ability of the site to source water and discharge effluent to receiving waterbodies and entities.

#### References

3rd UN World Water Development Report: 2009 (www.unesco.org): After agriculture, the two major users of water for development are industry and energy (20% of total water withdrawals), which are transforming the patterns of water use in emerging market economies. Water and energy share the same drivers: demographic, economic, social and technological processes put pressure on both energy and water. The recent acceleration in the production of biofuels and the impacts of climate change bring new challenges and add to the pressures on land and water resources.

Level Selected	Dropdown Definition	Full Definition
0	None – industrial activity decrease	Evidence of this condition: <ul style="list-style-type: none"><li>• The industrial activity in the local area has decreased in the past five years.</li><li>• Demographic and economic projections predict future declines in industrial activity.</li><li>• Non-fresh produced water sources are not affected by industrial growth.</li><li>• Reinjection of non-fresh produced water for production is not affected by industrial growth.</li></ul>
1	Low – near constant or slow growth	Evidence of this condition: <ul style="list-style-type: none"><li>• The industrial activity of the local area has been constant or increased slightly in the last five years.</li><li>• Demographic and economic projections predict near constant industrial activity levels in the future.</li><li>• The site has not faced competition from new industrial users for water sources.</li><li>• The site has not been affected by water discharge from new industrial users.</li></ul>
2	Medium – moderate growth	Evidence of this condition: <ul style="list-style-type: none"><li>• The industrial activity of the local area has increased moderately in the last five years.</li><li>• Demographic and economic projections predict moderate industrial growth rates.</li><li>• Industrial use of water is growing in the area, but there has been no discussion of changes in allocations.</li><li>• Industrial discharges are increasing in the area, but the local watershed had not been affected.</li></ul>

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3	High – significant growth and competition	Evidence of this condition: <ul style="list-style-type: none"><li>Industrial activity in the area has increased significantly in the last five years.</li><li>Demographic and economic projections predict high industrial growth rates.</li><li>Industry is using significantly more water in the area. There has been a proposal to change the site’s allocations or rates.</li><li>Industry is discharging significantly more effluent in the area and the local watershed has been affected. The quality of the water sources and the site’s ability to discharge has been affected.</li></ul>
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#### Physical Supply Reliability - Oil and Gas Industry Growth (same for both Influent and Effluent)

Oil and Gas Industry Growth: Oil and gas industry growth is defined as the increase in sector activities in a given geographical area over a set period of time. While production and refining techniques vary in water requirements, an increase in oil and gas industry activity in an area can increase that sector’s demand for water and effluent discharges. Stakeholder attention may be drawn to the sector’s cumulative use and impacts in the area and may drive new local regulations.

Level	Dropdown Definition	Full Definition
0	None – oil and gas activity decrease	Evidence of this condition: <ul style="list-style-type: none"><li>The oil and gas industry activity in the local area has decreased in the past five years.</li><li>Projections predict future declines in oil and gas industry activity.</li></ul>
1	Low - near constant or slow growth	Evidence of this condition: <ul style="list-style-type: none"><li>The oil and gas industry activity of the local area has been constant or increased slightly in the last five years.</li><li>Projections predict near constant oil and gas industry activity levels in the future.</li><li>The site has not faced competition from new oil and gas industry users for water sources.</li><li>The site has not been affected by water discharge from new oil and gas industry activity.</li></ul>
2	Medium - moderate growth	Evidence of this condition: <ul style="list-style-type: none"><li>The oil and gas industry activity of the local area has increased moderately in the last five years.</li><li>Projections predict moderate oil and gas industry growth rates.</li><li>Oil and gas industrial use of water is growing in the area, but there has been no discussion of changes in allocations.</li><li>Oil and gas industrial discharges are increasing in the area, but the local watershed had not been affected.</li></ul>
3	High - significant growth and competition	Evidence of this condition: <ul style="list-style-type: none"><li>Oil and gas industrial activity in the area has increased significantly in the last five years.</li><li>Projections predict high oil and gas industry growth rates.</li><li>Oil and gas industry is using significantly more water in the area. There has been a proposal to change the site’s allocations or rates.</li><li>Oil and gas industry is discharging significantly more effluent in the area and the local watershed has been affected. The quality of the water sources and the site’s ability to discharge has been affected.</li></ul>

#### Physical Supply Reliability - Electrification Growth (same for both Influent and Effluent)

**Electrification Growth:** An increase in electrification coverage in a geographical area can increase that sector’s demand for water and the ability of users to directly use water. Electricity consumption increases in areas with existing electrification coverage can also increase water use in the production of energy. Existing water users may face increased competition for water sources, higher costs or reduced allocations. An increase in electricity production can also increase thermal loads and reduce quality in water sources and receiving waterbodies and entities. Reductions in the water availability and water quality in the area can affect the ability of the site to source water and discharge effluent to receiving waterbodies and entities.

References:  
**International Energy Agency** (<http://www.iea.org/weo/electricity.asp>) : Access to electricity is particularly crucial to human development as electricity is, in practice, indispensable for certain basic activities, such as lighting, refrigeration and the running of household appliances, and cannot easily be replaced by other forms of energy. Based on a detailed country-by-country database, it is estimated that in 2009 the number of people without access to electricity was 1.4 billion or 20% of the world’s population. Some 85% of those people live in rural areas.

Level Selected	Dropdown Definition	Full Definition
0	None – electricity consumption decrease or not applicable	Evidence of this condition: <ul style="list-style-type: none"><li>Electricity consumption in the local area has decreased in the past five years.</li><li>Demographic and economic projections predict future declines.</li><li>Offshore locations not connected to electricity grid.</li><li>Non-fresh produced water sources are not affected by electrification growth.</li><li>Reinjection of non-fresh produced water for production is not affected by electrification growth.</li></ul>
1	Low – near constant or slow growth	Evidence of this condition: <ul style="list-style-type: none"><li>Electrification coverage and electricity consumption of the local area has been constant or increased slightly (&lt;2%) in the last five years.</li><li>Demographic and economic projections predict near constant electricity consumption in the area in the future.</li><li>The site has not faced competition from electricity producers for water sources.</li><li>The site has not been affected by water discharge from electricity producers.</li></ul>
2	Medium – moderate growth	Evidence of this condition: <ul style="list-style-type: none"><li>Electrification coverage or electricity consumption of the local area has increased moderately (2-9.9%) in the last five years.</li><li>Demographic and economic projections predict moderate electricity growth rates in the future.</li><li>The use of water for electricity production is growing in the area, but there has been no discussion of changes in allocations.</li><li>Water discharges from electricity production are increasing in the area, but the local watershed had not been affected.</li></ul>

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3	High – significant growth and competition	Evidence of this condition: <ul style="list-style-type: none"><li>• Electrification coverage or electricity consumption in the area has increased significantly (&gt;10%) in the last five years.</li><li>• Demographic and economic projections predict high electricity growth rates in the future.</li><li>• Electricity production is using significantly more water in the area. There has been a proposal to change the site’s allocations or rates.</li><li>• Electricity production is discharging significantly more effluent in the area and the local watershed has been affected. The quality of the sources water and the site’s ability to discharge has been affected.</li></ul>
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#### Physical Supply Reliability - Projected Impacts of Climate Change (same for both Influent and Effluent)

**Projected Impacts of Climate Change:** The projected change in precipitation rates in the local area is the primary parameter for estimating the water availability risks related to the projected impacts of climate change. While the full hydrological cycle may have other changes in a given geographical area, the projected change in precipitation is available from global models and is selected as the proxy indicator for other climate change water risks. Projected timeframe is to 2050.

References:

According to the International Panel on Climate Change (IPCC), observational records and climate projections provide evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by climate change. Observed warming over several decades has been linked to the changes in the large-scale hydrological cycle such as: increasing atmospheric vapor content, changing precipitation patterns, intensity and extremes; reduced snow cover and widespread melting of ice; and changes in soil moisture and runoff.

Bates, B.C., Z.W. Kundzewicz, S. Wu and J.P. Palutikoff, Eds., 2008: Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210 pp.

Level Selected	Dropdown Definition	Full Definition
0	None - gain in precipitation or not applicable	Evidence of this condition: <ul style="list-style-type: none"><li>• Seawater sourced from deep offshore locations is not affected by climate change.</li><li>• Water discharged to deep offshore locations is not affected by climate change.</li><li>• Some areas are projected to see a rise in precipitation. An area with a projected rise in precipitation is considered to have zero stress on this issue.</li><li>• Non-fresh produced water sources are not affected by projected impacts of climate change.</li><li>• ReInjection of non-fresh produced water for production is not affected by projected impacts of climate change.</li></ul>
1	Low – no change to slight change in precipitation	Projected decrease in precipitation is minimal: <3% decrease on an annual basis from current conditions to 2050.
2	Medium – moderately less precipitation	Projected decrease in precipitation is moderate: 3-9.9% decrease on an annual basis from current conditions to 2050.
3	High – significantly less precipitation	Projected decrease in precipitation is high: >10% decrease on an annual basis from current conditions to 2050.

#### Ecosystems Local - (same for both Influent and Effluent)

**Local Ecosystems:** An ecosystem is an integrated system formed by the interaction of a community of living organisms, the non-living physical environment, and the processes that affect them. A local ecosystem is defined as the ecosystem, primarily the aquatic and wetland components of that ecosystem, in close proximity to the Company’s specific site. An example of a local ecosystem is the segment of river at the intake point of water withdrawal.

References:

3rd UN World Water Development Report: 2009 (www.unesco.org) Freshwater ecosystems provide an extensive array of vital services to support human well-being. A variety of economic and recreational activities such as navigation, fisheries and pastoral activities depend on direct use of water in healthy ecosystems. Yet some

Level Selected	Dropdown Definition	Full Definition
0	Non-communicating underground source or discharge point	Sources from and discharge points to non-communicating underground reservoirs are not considered to have ecosystems.
1	Low – no or minimal levels of local ecosystem stress	Evidence of this condition: <ul style="list-style-type: none"><li>• Biological and/or habitat information indicating a balanced, healthy community of indigenous organisms</li><li>• Designation or scientific recognition of the ecosystem as being healthy (not stressed or minimally stressed) with respect to water quality, species diversity, fisheries, threatened and endangered species habitat, or other ecosystem services.</li><li>• No known threatened or endangered species habitat.</li><li>• If biological or habitat information is unavailable, there is evidence of minimal levels of human disturbance of the local ecosystem (e.g., land use, water quality)</li></ul>
2	Medium – moderate levels of local ecosystem stress	Evidence of this condition: <ul style="list-style-type: none"><li>• Biological and/or habitat information indicating a moderately stressed community of organisms as reflected by such factors as:<ul style="list-style-type: none"><li>- Moderate degree of habitat alteration</li><li>- Loss of native species diversity and loss of sensitive species</li><li>- Reduced native species abundance</li><li>- Increased non-native species abundance</li></ul></li><li>• Designation or scientific recognition of the ecosystem as being moderately stressed with respect to water quality, habitat, native species diversity and abundance, fisheries, or other ecosystem services</li><li>• If biological or habitat information is unavailable, there is evidence of moderate levels of human disturbance of the local ecosystem (e.g., land use, water quality)</li></ul>

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3	High – substantial levels of local ecosystem stress	Evidence of this condition: <ul style="list-style-type: none"><li>• Biological and/or habitat information indicating a highly stressed community of organisms as reflected by such factors as:<ul style="list-style-type: none"><li>- High degree of habitat alteration</li><li>- Loss of native species diversity and loss of sensitive species</li><li>- Reduced native species abundance</li><li>- Reduced key indicator species</li><li>- Community dominance by tolerant or non-native species</li></ul></li><li>• Designation or scientific recognition of the ecosystem as being highly stressed with respect to water quality, habitat, native species diversity and abundance, fisheries, or other ecosystem services</li><li>• If biological or habitat information is unavailable, there is evidence of high levels of human disturbance of the local ecosystem (e.g., land use, water quality)</li></ul>
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#### Ecosystems Watersheds - (same for both Influent and Effluent)

**Watershed Ecosystem:** A watershed’s ecosystem covers a larger area than the local ecosystem surrounding the Company’s specific site. A watershed ecosystem is defined as the ecosystem, primarily the aquatic and wetland components, extending both upstream and downstream of a site. An example would be the watershed of a river extending upstream of a site’s water intake to the headwaters and extending downstream to the river’s next confluence with a major tributary stream

Level Selected	Dropdown Definition	Full Definition
0	Non-communicating underground source or discharge point	Sources from and discharge points to non-communicating underground reservoirs are not considered to have ecosystems.
1	Low – no or minimal levels of watershed ecosystem stress	Evidence of this condition: <ul style="list-style-type: none"><li>• Biological, habitat, and/or land use information indicating a low degree of ecosystem stress (high degree of ecosystem health) throughout most of the watershed</li><li>• Designation or scientific recognition of substantial areas of the watershed as healthy (not stressed or minimally stressed) with respect to water quality, species diversity, fisheries, threatened and endangered species habitat, or other ecosystem services</li></ul>
2	Medium – moderate levels of watershed ecosystem stress	Evidence of this condition: <ul style="list-style-type: none"><li>• Biological, habitat, and/or land use information indicating moderately stressed ecosystem health in substantial areas of the watershed, as reflected by such factors as:<ul style="list-style-type: none"><li>- Developed land uses, deforestation, or loss of riparian buffers</li><li>- Moderate degree of overall habitat alteration</li><li>- Loss of native species diversity and loss of sensitive and threatened species</li><li>- Increased occurrence of non-native species</li></ul></li><li>• Designation or scientific recognition of substantial areas of the watershed as being moderately stressed with respect to water quality, habitat, native species diversity and abundance, fisheries, or other ecosystem services</li></ul>
3	High – substantial levels of watershed ecosystem stress	Evidence of this condition: <ul style="list-style-type: none"><li>• Biological, habitat, and/or land use information indicating highly stressed ecosystem health throughout the watershed, as reflected by such factors as:<ul style="list-style-type: none"><li>- Widespread development, deforestation, or loss of riparian buffers</li><li>- High degree of overall habitat alteration</li><li>- Loss of native species diversity and loss of sensitive species</li><li>- Predominance of tolerant or non-native species</li><li>- Reduced key indicator species</li></ul></li><li>• Designation or scientific recognition of substantial areas of the watershed as being highly stressed with respect to water quality, habitat, native species diversity and abundance, fisheries, or other ecosystem services</li></ul>

#### Regulatory Issues: Current

**Current Regulatory Issues:** Current regulatory issues are those regulatory requirements and constraints that influence a site’s water-based processes, operations, costs, and compliance under current laws and regulations. An example of a current regulatory issue is the ability of a site intake to continue withdrawing process or cooling water during severe drought when stream flows are critically low. This includes water availability determinations by applicable regulatory authorities.

Level Selected	Dropdown Definition	Full Definition
0	Not Included	A finite amount of regulation is applicable to every water source.
1	Low – minimal difficulty of current issues	Evidence of this condition: <ul style="list-style-type: none"><li>• No existing compliance issues at site</li><li>• No current issues known that would drive changes in water processes, increases in project investment, or interruptions in site operations</li></ul>
2	Medium – moderate difficulty of current issues	Evidence of this condition: <ul style="list-style-type: none"><li>• Minor existing compliance issues at site</li><li>• Current issues could drive small changes in water processes or increases in project investment but no interruptions in site operations</li><li>• Absence of regulations</li><li>• Current regulations are less stringent than those recommended by global organizations (such as World Health Organization).</li></ul>
3	High – high difficulty of current issues	Evidence of this condition: <ul style="list-style-type: none"><li>• Existing compliance issues at site are of concern</li><li>• Current issues will drive difficult changes in water processes, substantial increases in project investment, or interruptions in site operations</li></ul>

#### Regulatory Issues: Potential

**Potential Regulatory Issues:** Potential regulatory issues are reasonably foreseeable future (in next 5 years) changes in regulatory requirements and constraints that could

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**Potential Regulatory Issues:** Potential regulatory issues are reasonably foreseeable future (in next 5 years) changes in regulatory requirements and constraints that could influence a site’s water-based processes, operations, costs, and compliance under new or revised laws and regulations. New laws and regulations are often driven by changes in best available and economic technologies. An example of a potential regulatory issue is an anticipated proposed new regulation setting technology standards

Level Selected	Dropdown Definition	Full Definition
0	Not Included	A finite amount of regulation is applicable to every water source.
1	Low – minimal difficulty of potential issues	Evidence of this condition: <ul style="list-style-type: none"><li>• No foreseeable issues (in the next five years) that would drive changes in water processes, increases in project investment, or interruptions in site operations.</li><li>• Greater watershed is not in stressed condition and future regulations with respect to availability or quality are not expected in the next five years.</li><li>• Restrictions on inter-basin transfers are not expected to reduce availability or quality of water at site in the next five years.</li></ul>
2	Medium – moderate difficulty of potential issues	Evidence of this condition: <ul style="list-style-type: none"><li>• Foreseeable issues (in the next five years) will drive small changes in water processes or increases in project investment but no interruptions in site operations.</li><li>• Greater watershed is in equilibrium condition but future regulations with respect to availability or quality are possible in the next five years.</li><li>• Restrictions on inter-basin transfers may reduce availability or quality of water at site in the next five years.</li></ul>
3	High – significant difficulty of potential issues	Evidence of this condition: <ul style="list-style-type: none"><li>• Anticipated regulations will drive difficult or costly changes in water processes, lengthy permitting processes, and/or costly interruptions in site operations.</li><li>• Greater watershed is in stressed condition and future regulations with respect to availability or quality are expected in the next five years.</li><li>• Restrictions on inter-basin transfers are expected to reduce availability or quality of water at site in the next five years.</li></ul>

#### Economics: Delivered Cost

**Economics – Delivered Costs:** The delivered cost of water from an influent source is defined as the total of the raw water cost, water licenses and costs to transport the water from the source to the point of use. The transport cost includes the construction and operation of pipelines. Transport costs also include contractor costs for water delivery by ship or truck. Treatment costs are considered separately.

Level Selected	Dropdown Definition	Full Definition
0	Not Included	There is a finite cost to delivering water from any influent source.
1	Low – minimal delivery cost	Evidence of this condition: <ul style="list-style-type: none"><li>• No or minimal cost for the raw water.</li><li>• No or minimal energy or contractor cost to transport the raw water.</li><li>• No or minimal license or permit fees.</li><li>• Delivery logistics or infrastructure costs are not expected to increase in the future.</li></ul>
2	Medium – moderate delivery costs but not expected to change	Evidence of this condition: <ul style="list-style-type: none"><li>• Moderate cost for the raw water.</li><li>• Infrastructure to transport water is established.</li><li>• Moderate energy or contractor costs to transport the raw water.</li><li>• Moderate license or permit fees.</li><li>• Delivery logistics or infrastructure costs are not expected to increase in the future.</li></ul>
3	High – high cost of water or major new capital infrastructure or transport costs forecast	Evidence of this condition: <ul style="list-style-type: none"><li>• Raw water costs are high or expected to significantly increase.</li><li>• Current delivery method for raw water from the influent source is insufficient in the future.</li><li>• Major capital equipment installation (such as a pipeline or canal) is forecast.</li><li>• Contractor costs for vehicle-based delivery forecast to significantly increase.</li></ul>

#### Economics: Treatment Cost (same for influent and effluent)

**Economics – Treatment Costs:** The costs of treatment of influent source water for industrial purposes depend on the volume of the water flow and the quality of the influent and that required for the industrial process. The cost of treatment to render industrial wastewater suitable for discharge depends on the volume of the wastewater flow and the quality improvement required for discharge. Advanced influent and wastewater treatment can require significant capital expenditure for facilities and ongoing operational costs from electricity and chemical addition. Delivery costs and discharge costs are considered separately. Treatment of produced

Level Selected	Dropdown Definition	Full Definition
0	Not Included	Every water source or discharge to receiving waterbody/entity requires a finite amount of treatment,
1	Low – minimal treatment	Evidence of this condition: <ul style="list-style-type: none"><li>• Use of water from the influent source requires minimal treatment (such as clarifier or gravity solids removal).</li><li>• Discharge to the receiving waterbody/entity requires minimal treat.</li><li>• Treatment requirements are not expected to change in the future.</li></ul>
2	Medium – multistage treatment required but not expected to change	Evidence of this condition: <ul style="list-style-type: none"><li>• Use of water from the influent source requires multiple treatment steps (such as filtration, flocculation, demineralization, deaeration) and chemical addition.</li><li>• Discharge to the receiving waterbody/entity requires multiple treatment steps (such as biological, filtration, aeration) and chemical addition.</li><li>• Treatment requirements are not expected to significantly change in the future.</li></ul>

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3	High – major new capital facility or treatment costs forecast	Evidence of this condition: <ul style="list-style-type: none"><li>• Current treatment for use of water from the influent source is insufficient. Major capital equipment installation with multiple treatment steps (such as filtration, flocculation, demineralization, deaeration) and chemical addition are forecast.</li><li>• Current treatment for discharge to the receiving waterbody/entity is insufficient. Major capital equipment installation with multiple treatment steps (such as biological, filtration, aeration) and chemical addition are forecast.</li></ul>
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#### Social Context: Local Reputation (same for influent and effluent)

**Social Context – Local Reputation:** The reputation of the company as a whole and the company site in the local area can affect that site’s license to operate on a number of factors including the ability to source water and discharge effluent to receiving waterbodies and entities. This issue focuses on the reputation of the company site in the local community. Local reputation can be viewed as the perception that the community has of the extent of adoption of water best management practices (BMPs) across the site.

References:

Institute for Public Relations: ([www.instituteforpr.org/topics/reputation](http://www.instituteforpr.org/topics/reputation)) Reputation is a core (intangible) asset of the firm and creates barriers to competitive threats. To the extent that stakeholders believe that the organization meets their needs better than can competitors, they will behave toward the organization in desirable ways, e.g., invest, join, support, etc. As companies meet the needs and interests of stakeholders over time, they increase their reputation resilience and diminish their

Level Selected	Dropdown Definition	Full Definition
0	Not included	An External Stress Severity Level of zero is not allowed for reputational issues. If a company has operations at a site, there is a finite amount of reputational awareness by the community.
1	Low – positive to neutral community acceptance and media	The site is viewed positively or neutrally by the local community. Evidence of this condition: <ul style="list-style-type: none"><li>• Some cases (&lt;10) of negative media attention on environmental issues at the site in past 20 years.</li><li>• Some cases (&lt;10) of community action toward site on environmental issues in past 20 years</li><li>• Issues raised have been resolved to community satisfaction.</li><li>• Presence of strong community engagement program</li><li>• Perception of good water management or broad implementation of water BMPs across site, possibly including recycling or low-water technologies</li></ul>
2	Medium – community action and negative media on environmental issues	The site is viewed with some negativity by the local community. Evidence of this condition: <ul style="list-style-type: none"><li>• Numerous cases (&gt;10) of negative media attention on environmental issues at the site in past 20 years.</li><li>• Numerous cases (&gt;10) of community action toward site on environmental issues in past 20 years</li><li>• Most issues raised have been resolved to community satisfaction.</li><li>• Weak community engagement program</li><li>• Perception of selective implementation of water BMPs across site, possibly including recycling or low-water technologies</li></ul>
3	High – major water issue with community or current issues open	The site has received significant negative community attention in the past or may have current issues yet to be resolved. Evidence of this condition: <ul style="list-style-type: none"><li>• Focused media attention on a water-related issue at the site in past 20 years.</li><li>• Community action, supported by community leaders and elected officials, towards the site on a water issue in past 20 years</li><li>• A water-related issue is open or closed but have not been resolved to community satisfaction.</li><li>• Perception of no implementation of water BMPs across site, possibly including wasteful practices.</li></ul>

#### Social Context: Availability and Quality of Water for Human Needs (same for influent and effluent)

**Social Context: Availability and Quality of Water for Human Needs:** Human needs for water include household (drinking, cooking, sanitation) and recreation (tourism, lakes, streams) uses. In areas of the world that have inadequate water supply for human needs, there is local pressure to allocate available water for basic needs (food crops and human consumption) rather than industrial needs. Particularly in times of drought when water availability and quality may decrease, industrial users who have legal license to use water may face community pressure to reduce or cease water usage to increase allocations for human use.

References:

UN Water for Life Decade (<http://www.un.org/waterforlifedecade/scarcity.html>). Hydrologists typically assess scarcity by looking at the population-water equation. An area is experiencing water stress when annual water supplies drop below 1 700 m3 per person. When annual water supplies drop below 1 000 m3 per person, the population faces water scarcity, and below 500 cubic meters "absolute scarcity". In 2011, the UN estimates that around 700 million people in 43 countries suffer today from water scarcity.

WHO/UNICEF Joint Monitoring Project (JMP): (<http://www.wssinfo.org>). An improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination, in particular from contamination with fecal matter. As of 2008, the JMP estimated that the use of improved sources of drinking-water is high globally, with 87% of the world population and 84% of the people in developing regions getting their drinking-water from such

Level Selected	Dropdown Definition	Full Definition
0	None – no expectation of water supply from area	Evidence of this condition: <ul style="list-style-type: none"><li>• There is no historical supply of water for human needs to this site.</li><li>• Deep or shallow offshore site location.</li><li>• Non-fresh produced water sources are not affected by availability and quality of water for human needs.</li><li>• Reinjection of non-fresh produced water for production is not affected by availability and quality of water for human needs.</li></ul>

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1	Low – high availability and quality of water in community	Evidence of this condition: <ul style="list-style-type: none"><li>• Community has full access to improved water supply.</li><li>• Community’s human water needs are not limited by availability or quality of water.</li><li>• No media coverage of water shortages or quality concerns for human needs in the area.</li><li>• Demographic projections predict population levels within water availability in the future.</li><li>• The site has not faced competition from municipalities for water sources.</li></ul>
2	Medium – community has incomplete access to improved supply or interruptions during dry seasons	Evidence of this condition: <ul style="list-style-type: none"><li>• Community has incomplete access to improved water supply.</li><li>• Community’s human water needs are limited by availability or quality of water in dry seasons.</li><li>• There have been a few cases of media coverage of water shortages or quality concerns for human needs in the area.</li><li>• Demographic projections predict population levels at near constant levels in the future.</li><li>• The site has not faced competition from with municipalities for water sources.</li></ul>
3	High – community has low access to improved supply or regular interruptions	Evidence of this condition: <ul style="list-style-type: none"><li>• Community has low access to improved water supply.</li><li>• Community’s human water needs are regularly limited by availability or quality of water.</li><li>• There have been numerous cases of media coverage of water shortages or quality concerns for human needs in the area.</li><li>• Demographic projections predict growth in population levels in the future.</li><li>• The site has faced competition from municipalities for water sources.</li></ul>

#### Social Context: Availability of Water for Local Food Supply (same for influent and effluent)

**Social Context: Availability of Water for Local Food Supply:** In some areas of the world, irrigation is required to grow crops. Livestock production also requires water. In areas of the world that have inadequate food supply, there is local pressure to allocate available water for basic needs (food crops, livestock production and human consumption) rather than industrial needs. Particularly in times of drought, industrial users who have legal license to use water may face community pressure to reduce or cease water usage to increase allocations for human use.

##### References:

3rd UN World Water Development Report: 2009 ([www.unesco.org](http://www.unesco.org)): Agriculture is also facing competition for water from other sectors, and its allocation is decreasing in water-scarce areas, especially around urban centers. The increasing number of areas where water has become a limiting factor for irrigated agriculture, associated with rising claims for releasing water to guarantee or restore environmental services, has tightened food production in some regions. The Middle East, for example, can no longer satisfy its food requirements and relies increasingly on food imports.

Level Selected	Dropdown Definition	Full Definition
0	None – no expectation of food supply from area	Evidence of this condition: <ul style="list-style-type: none"><li>• There is no historical agricultural or livestock production activity in the area and no projections of activity in the future.</li><li>• Deep or shallow offshore site location.</li><li>• Non-fresh produced water sources are not affected by availability of water for local food supply.</li><li>• Reinjection of non-fresh produced water for production is not affected by availability of water for local food supply.</li></ul>
1	Low – abundance of food supply in community from multiple sources	Evidence of this condition: <ul style="list-style-type: none"><li>• Community has multiple sources of food supply – both local and imported (national or international).</li><li>• Local food supply is not limited by availability of water.</li><li>• No media coverage of food shortages related to water in the area.</li><li>• Demographic and economic projections predict near constant population and agricultural activity levels in the future.</li><li>• The site has not faced competition from with agriculture or livestock production for water sources.</li></ul>
2	Medium – community dependent on local food supply which is not limited by water	Evidence of this condition: <ul style="list-style-type: none"><li>• Community is primarily dependent on local food supply.</li><li>• Local food supply is abundant but has occasional spot shortages of local crops due to limited availability of water.</li><li>• No media coverage of food shortages related to water in the area.</li><li>• Demographic and economic projections predict near constant population and agricultural activity levels in the future.</li><li>• The site has not faced competition with agriculture or livestock production for water sources.</li></ul>
3	High – community dependent on local food supply which is limited by water availability	Evidence of this condition: <ul style="list-style-type: none"><li>• Community is dependent on local food supply.</li><li>• Local food supply is limited by availability of water.</li><li>• There has been media coverage of food shortages related to water in the area.</li><li>• Demographic and economic projections predict near growth in population levels and required agricultural activity levels in the future.</li><li>• The site has faced competition with agriculture or livestock production for water sources.</li></ul>

#### Social Context: Social Activism (same for influent and effluent)

**Social Context: Social Activism:** Social activism against a company as a whole can affect a single site’s license to operate on a number of factors including the ability to source water and discharge effluent to receiving waterbodies and entities. This issue focuses on the global or national campaigns against the company’s environmental performance of its products or operations. The Reputational issue focuses on local stakeholder pressure in the local community.

##### References:

Wikipedia ([www.wikipedia.org](http://www.wikipedia.org)): Activism consists of intentional action to bring about social, political, econmic, or enviromental change. Activism can take a wide range of forms from writing letters to newspapers or politicians, political campaigning, econmic activissm such as boycotts or preferentially patronizing businesses, rallies,

## Droplist - Module 2

Version 1.0 - March 2012

### External Stress Severity Level

Level Selected	Dropdown Definition	Full Definition
0	Not included	An External Stress Severity Level of zero is not allowed for Social Activism issues. If a company has operations at a site, there is a finite level of social activism against the company.
1	Low – limited national or global environmental campaigns	The company is viewed positively or neutrally by national and global stakeholders groups. Evidence of this condition: <ul style="list-style-type: none"><li>• Few (&lt;5) cases of negative national or global media attention on the company on an environmental issue in past 10 years or more</li><li>• Few (&lt;5) cases of targeted national or global campaigns on the company on an environmental issue in past 10 years or more</li></ul>
2	Medium – multiple national or global environmental campaigns	The company has been the target of national or global activist campaigns. Evidence of this condition: <ul style="list-style-type: none"><li>• Multiple (&gt;5) cases of negative national or global media attention on the company on an environmental issue in past 10 years or more</li><li>• Multiple (&gt;5) cases of targeted national or global campaigns on the company on an environmental issue in past 10 years.</li><li>• Issues raised have settled with general stakeholder satisfaction.</li></ul>
3	High –national or global water-related campaign –past or current	The company has been or is the target of a national or global activist campaign related to water. Evidence of this condition: <ul style="list-style-type: none"><li>• Company is currently the target of water-related campaigns about its products or business practices.</li><li>• Company has been the target of water-related campaigns about its products or business practices.</li><li>• Company is named as a defendant in a high profile water-related lawsuit with national or global media attention</li></ul>

### Module 2: External Local Conditions-Effluent

#### Physical Receiving Entity Characteristics - Capacity

**Capacity:** Capacity is defined as the ability of the receiving waterbody or entity or underground formation to accommodate or absorb additional pollutants or discharge volume without degradation of water quality (e.g., surface water or groundwater) or without depleting the treatment capacity of a receiving entity such as a municipal wastewater treatment plant (WWTP). The determination of capacity of a municipal WWTP would be made by municipal authorities.

0	Not included	Every receiving waterbody and entity has a finite capacity.
1	Low – capacity good	Evidence of this condition: <ul style="list-style-type: none"><li>• Water quality information or modeling indicates substantial capacity of the receiving waterbody/entity to accommodate additional pollutants or volume</li><li>• No known water quality limitations as a result of pollutant loading</li><li>• An external WWTP receiving entity or underground formation can readily accommodate additional volume and pollutant load</li></ul>
2	Medium – capacity moderate	Evidence of this condition: <ul style="list-style-type: none"><li>• Water quality information or modeling indicates moderate capacity of the receiving waterbody/entity to accommodate additional pollutants or volume</li><li>• Some water quality limitations are known</li><li>• An external WWTP receiving entity or underground formation can accommodate moderate additional volume and pollutant load</li></ul>
3	High – capacity limited or exceeded	Evidence of this condition: <ul style="list-style-type: none"><li>• Water quality information or modeling indicates limited to nonexistent capacity of the receiving waterbody/entity to accommodate additional pollutants or volume</li><li>• Severe water quality limitations are known</li><li>• An external WWTP receiving entity or underground formation cannot accommodate any additional volume and pollutant load</li></ul>

#### Regulatory Issues - Current

**Current Regulatory Issues:** Current regulatory issues are those regulatory requirements and constraints that influence a site’s water-based processes, operations, costs, and compliance under current laws and regulations. An example of a current regulatory issue is the ability of a site to consistently meet effluent limits in the existing discharge permit.

1	Low – minimal difficulty of current issues	Evidence of this condition: <ul style="list-style-type: none"><li>• No existing compliance issues at site</li><li>• No current issues known that would drive changes in water processes, increases in project investment, or interruptions in site operations</li></ul>
2	Medium – moderate difficulty of current issues	Evidence of this condition: <ul style="list-style-type: none"><li>• No existing compliance issues at site</li><li>• Current issues could drive small changes in water processes or increases in project investment but no interruptions in site operations</li></ul>
3	High – significant difficulty of current issues	Evidence of this condition: <ul style="list-style-type: none"><li>• Existing compliance issues at site are of concern</li><li>• Current issues will drive difficult changes in water processes, substantial increases in project investment, or interruptions in site operations</li></ul>

#### Regulatory Issues: Potential

**Potential Regulatory Issues:** Potential regulatory issues are reasonably foreseeable future changes (in next 5 years) in regulatory requirements and constraints that could influence a site’s water-based processes, operations, costs, and compliance under new or revised laws and regulations. An example of a potential regulatory issue is an anticipated proposed new regulation setting more stringent effluent limitations at the site discharge point.



## Droplist - Module 2

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### External Stress Severity Level

Level Selected	Dropdown Definition	Full Definition
0	Not Included	A finite amount of future regulation is applicable to every receiving waterbody/entity.
1	Low – minimal difficulty of potential issues	Evidence of this condition: <ul style="list-style-type: none"><li>• No foreseeable issues (in the next five years) that would drive changes in effluent water processes, increases in project investment, or interruptions in site operations</li></ul>
2	Medium – moderate difficulty of potential issues	Evidence of this condition: <ul style="list-style-type: none"><li>• Foreseeable issues (in the next five years) likely to drive small changes in effluent water processes or increases in project investment but no interruptions in site operations</li></ul>
3	High – significant difficulty of potential issues	Evidence of this condition: <ul style="list-style-type: none"><li>• Anticipated regulations will drive difficult or costly changes in effluent water processes, lengthy permitting processes, and/or costly interruptions in site operations</li></ul>

#### Economics: Discharge Cost

**Economics – Discharge Costs:** The discharge cost of water to a receiving waterbody/entity is defined as the total of the discharge fees and costs to transport the water from the point of use or generation to the receiving waterbody/entity. The transport cost includes the construction and operation of pipelines. Transport costs also include contractor costs for water movement by ship or truck. Treatment costs are considered separately.

0	Not Included	There is a finite cost to discharge water to any receiving waterbody/entity.
1	Low – minimal discharge costs	Evidence of this condition: <ul style="list-style-type: none"><li>• No or minimal energy or contractor cost to transport the effluent to the receiving waterbody/entity.</li><li>• No or minimal discharge license or permit fees.</li><li>• Discharge point, fees, transport and infrastructure costs are not expected to increase in the future.</li></ul>
2	Medium – moderate discharge costs but not expected to change	Evidence of this condition: <ul style="list-style-type: none"><li>• Infrastructure to transport effluent to receiving waterbody/entity is established.</li><li>• Moderate energy or contractor costs to transport the effluent to the receiving waterbody/entity.</li><li>• Moderate discharge license or permit fees.</li><li>• Discharge point, fees, transport and infrastructure costs are not expected to significantly increase in the future.</li></ul>
3	High – major new capital infrastructure or transport costs forecast	Evidence of this condition: <ul style="list-style-type: none"><li>• Discharge fees expected to significantly increase.</li><li>• Current transportation method for effluent to the receiving waterbody/entity is insufficient in the future.</li><li>• Major capital equipment installation (such as a pipeline) is forecast.</li><li>• Contractor costs for vehicle-based transport forecast to significantly increase.</li></ul>

## Droplist - Module 3

Version 1.0 - March 2012

### Magnitude of Company Contribution

#### Module 3: External Impacts - Influent Source

Common Definitions for All Impact Categories

**Impact of Company’s Water Use on Availability of Water Source:** A Company may impact the availability of water from a specific source for other users by the amount of water withdrawn and not returned to the same point at the same quality (either returned to a different source or consumed).

**Impact of Company’s Water Use on Quality of Water Source:** A Company’s use of water from a specific source may impact the quality of the water source. For example, when water is withdrawn from shallow sources, the temperature of the remaining water may increase during warm seasons.

**Impact of Company’s Water Use on Local Ecosystems:** A Company’s volumetric water use from a specific source may impact the availability and quality of water for local ecosystems in close proximity to the Company’s site.

**Impact of Company’s Water Use on Availability and Quality of Water for Human Needs:** A Company’s volumetric water use from a specific source may impact the availability and quality of water for human needs in both the local and watershed areas if there is insufficient quantity of water available or quality is impacted by reduced flows.

**Impact of Company’s Water Use on Availability and Quality of Water for Local Food Supply:** A Company’s volumetric water use from a specific source may impact the availability and quality of water for local food supply in both the local and watershed areas if there is insufficient quantity of water available or quality is impacted by

Level Selected	Dropdown Definition	Full Definition
0	Not included	If there is some amount of water use, then there is a finite amount of impact.
1	Minimal – insignificant use of water compared to other users.	Company’s water use is in the lowest quartile (lowest 25%) compared to other anthropogenic (human, industry, agriculture) water users in the local area.
2	Medium – water use is similar to others in the area.	Company’s water use is in the mid range (25 to 75%) compared to other anthropogenic (human, industry, agriculture) users in the area.
3	High – water use is one of largest in area.	Company is a top quartile (top 25%) anthropogenic (human, industry, agriculture) water user in the area.

#### Module 3: External Impacts - Effluent Source

Impact on capacity of receiving water body

**Impact of Company’s Water Discharge on the Capacity of the Receiving Waterbody or Entity.** A company may impact the capacity of a waterbody or receiving entity by discharging too much water in a given timeframe. This impact is most likely to occur in situations where water is being discharged to central treatment facilities

Level Selected	Dropdown Definition	Full Definition
0	Not Included	If there is some amount of effluent discharge, then there is a finite amount of impact.
1	Minimal – insignificant discharge of water compared to other dischargers.	Company’s volumetric discharge is in the lowest quartile (lowest 25%) compared to other dischargers in the local area.
2	Medium – water discharge is similar to others in the area.	Company’s volumetric water discharge is in the mid range (25 to 75%) compared to other dischargers in the area.
3	High – water discharge is one of largest in area.	Company is a top quartile (top 25%) dischargers in the area.

All Other Impact Categories share the same definitions

**Impact of Company’s Effluent Discharge on the Quality of Receiving Waterbody or Entity:** A company’s discharge may impact the quality of the waterbody if the discharge has a different temperature or chemical constituency such as pollutants or salts. A company’s discharge “load” is the combination of the volume and quality of the effluent.

**Impact of Company’s Effluent Discharge on Local Ecosystems:** A company’s discharge may impact the health of local ecosystems if the discharge has a different temperature or chemical constituency than the ecosystem’s background water. A company’s discharge “load” is the combination of the volume and quality of the effluent.

**Impact of Company’s Effluent Discharge on Availability and Quality of Water for Human Needs:** A Company’s effluent discharge may impact the availability and quality of water for human needs in both the local and watershed areas if the discharge has a different temperature or chemical constituency than needed. A company’s discharge “load” is the combination of the volume and quality of the effluent.

**Impact of Company’s Effluent Discharge on Availability and Quality of Water for Local Food Supply:** A Company’s effluent discharge may impact the availability and quality of water for local food supply in both the local and watershed areas if the discharge has a different temperature or chemical constituency than agricultural or

Level Selected	Dropdown Definition	Full Definition
0	Not Included	If there is some amount of effluent discharge, then there is a finite amount of impact.
1	Minimal – insignificant discharge load compared to others.	Company’s water discharge load (volume, chemical constituents or temperature differential) is in the lowest quartile (lowest 25%) compared to other dischargers in the local area.
2	Medium – discharge load is similar to others in the area.	Company’s water discharge load (volume. chemical constituents or temperature differential) is in the mid range (25 to 75%) compared to other dischargers in the area.
3	High – discharge load is one of largest in area.	Company’s water discharge load (volume, chemical constituents or temperature differential) is in the top quartile (top 25%) compared to other dischargers in the area.



Data Source List

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[Link to Suggested Data Source List by Region and Country](#)

Issues	Relevance		Global Datasets			
	Influent	Effluent	Dataset Name Dataset Owner	Web Link	Data Level	Suggestions for Identifying Data for Specific Site
Physical Source Characteristics (Current)						
Availability	X		Annual Renewable Water Supply per Person by Projections – 2025 WRI Dataset	<a href="http://www.wbcsd.org/web/watertool.htm">www.wbcsd.org/web/watertool.htm</a>	Watershed	Data may be found by lat-long coordinate through the use of the WBCSD Global Water Tool. User should download GWT file from WBCSD website, enter lat-long location for the site, and run "Generate Watershed Report".
Quality	X	X	Global dataset of sufficient granularity does not exist.			Local dataset must be identified. Check local government authorities for data.
Drought patterns	X	X	UCL Global Drought Monitor	<a href="http://drought.mssl.ucl.ac.uk/drought.html?map=%2Fwww%2Fdrought%2Fweb_pages%2Fdrought.map&amp;program=%2Fcgi-bin%2Fmapserv&amp;root=%2Fwww%2Fdrought2%2Fmap_web_imagepath=%2Ftmp%2F&amp;map_web_imageurl=%2Ftmp%2F&amp;map_web_template=%2Fdrought.html">http://drought.mssl.ucl.ac.uk/drought.html?map=%2Fwww%2Fdrought%2Fweb_pages%2Fdrought.map&amp;program=%2Fcgi-bin%2Fmapserv&amp;root=%2Fwww%2Fdrought2%2Fmap_web_imagepath=%2Ftmp%2F&amp;map_web_imageurl=%2Ftmp%2F&amp;map_web_template=%2Fdrought.html</a>	Approximately 100 km	Drought levels available for past 36 months.
Capacity		X	Global dataset of sufficient granularity does not exist.			Local dataset must be identified. Check local government authorities for data.
Physical Supply Reliability (Future)						
Agricultural and livestock demand	X	X	Global dataset of sufficient granularity does not exist.			Local dataset must be identified. Check local government authorities for data.
Population growth	X	X	U.S. Census Bureau, Population Division	<a href="http://www.census.gov/ipc/www/idb/informationGateway.php">http://www.census.gov/ipc/www/idb/informationGateway.php</a>	Country	Recommended settings: <ul style="list-style-type: none"><li>Choose country</li><li>Choose current year</li></ul> Population growth rates for 2005 and 2015 are shown.
Industrial growth	X	X	Wikipedia - sourced from CIA World Fact Book	<a href="http://en.wikipedia.org/wiki/List_of_countries_by_industrial_production_growth_rate">http://en.wikipedia.org/wiki/List_of_countries_by_industrial_production_growth_rate</a>	Country	Industrial growth rate by country shown.
Electrification growth	X	X	U.S. Energy Information Administration	<a href="http://www.eia.gov/oiaf/ieo/graphic_data_electricity.html">http://www.eia.gov/oiaf/ieo/graphic_data_electricity.html</a>	Country	Recommended settings: <ul style="list-style-type: none"><li>Choose region/country</li><li>Compare projections for 2015 to current year to determine growth rate</li></ul>



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	Influent	Effluent	Dataset Name Dataset Owner	Web Link	Data Level	Suggestions for Identifying Data for Specific Site
Projected impacts of climate change	X	X	The Nature Conservancy	<a href="http://www.climatewizard.org/">http://www.climatewizard.org/</a>	50-km Resolution	Recommended settings: <ul style="list-style-type: none"><li>• Analysis area: drill to site location</li><li>• Time period: Mid Century (2050s)</li><li>• Map of Change</li><li>• Measurement: Annual</li><li>• Emission Scenario: High A2</li><li>• General Circulation</li></ul> Model: Ensemble Average  Click on “Get Values” button and then on site location. Choose the average value (yellow line) from the chart that appears.
Ecosystems						
Local	X	X	<a href="#">Free global dataset of sufficient granularity does not exist.</a> <a href="#">Subscription service:</a> <a href="https://www.ibatforbusiness.org/">https://www.ibatforbusiness.org/</a>			Local dataset must be identified. IBAT for business states that it "is an innovative tool designed to facilitate access to accurate and up-to-date biodiversity information to support critical business decisions. Underlying data includes CI Biodiversity Hotspots and Wilderness Areas, Ramsar Sites, Protected Areas, Alliance for Zero Extinction sites, World Heritage Sites, Key Biodiversity Areas, Important Bird Areas, and the IUCN Red List.
Watershed	X	X	<a href="#">Free global dataset of sufficient granularity does not exist.</a> <a href="#">Subscription service:</a> <a href="https://www.ibatforbusiness.org/">https://www.ibatforbusiness.org/</a>			Local dataset must be identified. IBAT for business states that it "is an innovative tool designed to facilitate access to accurate and up-to-date biodiversity information to support critical business decisions. Underlying data includes CI Biodiversity Hotspots and Wilderness Areas, Ramsar Sites, Protected Areas, Alliance for Zero Extinction sites, World Heritage Sites, Key Biodiversity Areas, Important Bird Areas, and the IUCN Red List.
Regulatory						
Current	X	X	Global dataset of sufficient granularity does not exist.			Local dataset must be identified. Check local government authorities for data.
Potential	X	X	Global dataset of sufficient granularity does not exist.			Local dataset must be identified. Check local government authorities for data.
Economics						
Delivered costs	X		Global dataset of sufficient granularity does not exist.			Local dataset must be identified.
Treatment costs	X	X	Global dataset of sufficient granularity does not exist.			Local dataset must be identified.
Discharge costs		X	Global dataset of sufficient granularity does not exist.			Local dataset must be identified.
Social Context						



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Issues	Relevance		Global Datasets			
	Influent	Effluent	Dataset Name Dataset Owner	Web Link	Data Level	Suggestions for Identifying Data for Specific Site
Local reputation	X	X	Local Media Sources Google News	<a href="http://www.google.com/news">www.google.com/news</a>	Global to Site-Specific	Local media sources should be searched for site-specific media attention on environmental and water issues. Search of Google News employing "site name" and combinations of words such as "pollution, fine, environment, water" may identify local media stories.
Social activism	X	X	Google News	<a href="http://www.google.com/news">www.google.com/news</a>	Global	Search of Google News employing "company name" and combinations of words such as "pollution, fine, environment, water" may identify media stories.
Availability and quality of water for human needs	X	X	Access to Improved Water Source WHO/UNICEF JMP	<a href="http://www.wbcsd.org/web/watertool.htm">www.wbcsd.org/web/watertool.htm</a>	Country	Data may be found by lat-long coordinate through the use of the WBCSD Global Water Tool. User should download GWT file from WBCSD website, enter lat-long location for the site, and run "Generate Country Report".
Availability of water for local food supply	X	X	A Working Group of several organizations under the banner "River Threat"	<a href="http://www.riverthreat.net/data.html">http://www.riverthreat.net/data.html</a>	All data are provided in 30' latitude-longitude (i.e., 0.5° degree) gridded format in the Geographic projection	A range of threat indices maps are available on this website. A floating coordinate data reader allows identification by lat-long. There is an Agricultural Water Stress map.



## Definitions and Calculations

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### Definitions of Terms

Users are recommended to refer to comprehensive glossaries on water-related terms that have been developed by WBCSD in Water for Business (2010) or the Glossary of Hydrology, UN World Water Assessment Program (<http://hydrologie.org/glu/aglo.htm>).

**Selected terms employed in the GEMI LWT™ for Oil and Gas is defined below:**

**Barrel of oil equivalent (BOE):** For liquids, one BOE equals one barrel of oil or condensate. For gases, BOE equals approximately 5,800 standard cubic feet (Scf) of gas.

**Beneficial use:** Discharges directly to external organizations for specific use by industry, agriculture, human use or constructed wetlands.

**Chemical Oxygen Demand (COD):** Mass concentration of oxygen equivalent to the amount of a specified oxidant consumed by dissolved or suspended matter when a water sample is treated with that oxidant under defined conditions. Measurement units: mg/l.

**Dashboard:** An overview of key metrics and indicators for the user to quickly assess the performance of an operation.

**Degradation:** A concept related to the lowering in quality of a water body.

**Degradative water use:** Describes the quality change in water used and released back into the same watershed

**Depletion:** Continued withdrawal of water from groundwater or other water body at a rate greater than the rate of replenishment.

**Drilling and Completion Operations:** The activities of a company including seismic, drilling, completion, hydraulic fracturing, ice roads, pad development and people camps.

**Ecosystem:** An integrated system formed by the interaction of a community of living organisms, the non-living physical environment, and the processes that affect them.

**Effluent:** see water discharge.

**External Stress Severity Level:** describes the current conditions of a specific water source. It is a result of natural physical conditions and cumulative anthropogenic (human, industry, agriculture) impacts. Each External Stress Severity Issue and Level is defined on the “Droplist” worksheet.

**Gas Processing Operations:** The activities of a company including Liquefied Natural Gas (LNG) Plants, LNG Regasification Plants, gas treating, and Liquefied Petroleum Gas.

**Freshwater:** The constituent content of freshwater should be defined by local regulations. In the absence of local regulations, User should determine best definition for a site based on company policies and global guidelines. A limit of 1,000 mg/L of TDS (the limit set by the World Health Organization for drinking water) is the guidance for categorization of fresh and non-fresh for surface and groundwater. IPIECA’s definition of Freshwater states that the total dissolved solids (TDS) concentration of this water type is up to 2000 mg/l.

**Groundwater:** Subsurface water occupying the saturated zone.

**Impact:** A company’s individual impact on a particular water sources is defined as the extent to which the volume and/or quality of water used by a company in a specific watershed affects the availability of water for other uses or harms health or ecosystems in any other way.

**Influent source:** origin of water withdrawal.

**Internal Importance Level:** describes the business criticality of each Influent Source and Receiving Waterbody or Entity. Each Internal Importance Level is defined on the “Droplist” worksheet.

**Light/Medium Crude Oil:** is defined as having an API gravity higher than 23.3 °API. (less than 920 kg/m<sup>3</sup>)

**Management plan (method):** Defines how a company is addressing, implementing and monitoring performance on an issue.

**Municipal supply:** Supply of drinking quality water by a public organization.

**Non-communicating underground reservoir:** a confined subsurface water source with no hydrologic connection to other waterbodies.

**Non-Freshwater:** Water that is not considered fresh. See Freshwater definition.

**Oil Sands Operations:** The activities of a company to produce and upgrade oil or bitumen from surface mining or in-situ fields.

**Operation:** The site-level business function. Examples include refining, manufacturing, or mining.

**Opportunity:** Potential top line business enhancements created by voluntary sustainable water management actions.

**Performance indicator:** Qualitative or quantitative information about results or outcomes associated with an effort that is comparable and demonstrates change over time.

**Petrochemical Operations:** The activities of a company to convert hydrocarbons into chemicals and other products

**Petroleum Value Chain Operations:** Drilling and Completion, Production, Oil Sands, Transport and Terminals, Gas Processing, Refining, Petrochemicals, and Retail.



## Definitions and Calculations

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**Pollutant/pollution:** A substance/the addition of a substance that impairs the suitability of water for a considered purpose.

**Potable water:** Water that is suitable for drinking.

**Precipitation:** Liquid or solid products of the condensation of water vapor from clouds or deposited from air on the ground.

**Process:** specific activities within an operation. One site/operation may have multiple processes which use or discharge water. For example, a manufacturing operation may have a cooling process, a cleaning process and a chemical reaction process.

**Produced Water:** Water that is brought to the surface during production of hydrocarbons.

**Product:** Any material of commercial value which is extracted, processed, refined, manufactured or transported by an oil company.

**Production Operations:** The activities of a company to extract naturally occurring fossil fuel resources including oil production (primary, secondary/steam, tertiary, shale) or gas (conventional, coal bed methane, shale, hydrates, in-situ combustion). Hydraulic fracturing is considered to be a production operation.

**Quality:** The quality of a specific water body is defined by the suitability or condition of the water for a particular use based on its physical, chemical, and biological characteristics.

**Rainwater:** Rainwater volume should be entered under Module 1\_Influent if it is used onsite as a water source. If it just falls onsite and is not used, then it does not need to be entered.

**Receiving waterbody or entity:** Destination of water discharges.

**Recycled water:** The amount of used water/wastewater employed through another cycle back in the same process or in a higher use in the process cycle before discharge for final treatment and/or discharge to the environment.

**Recycled/Reused volumetric flowrate:** Recycled/reused water should be counted only once because water is extracted from its original source only once.

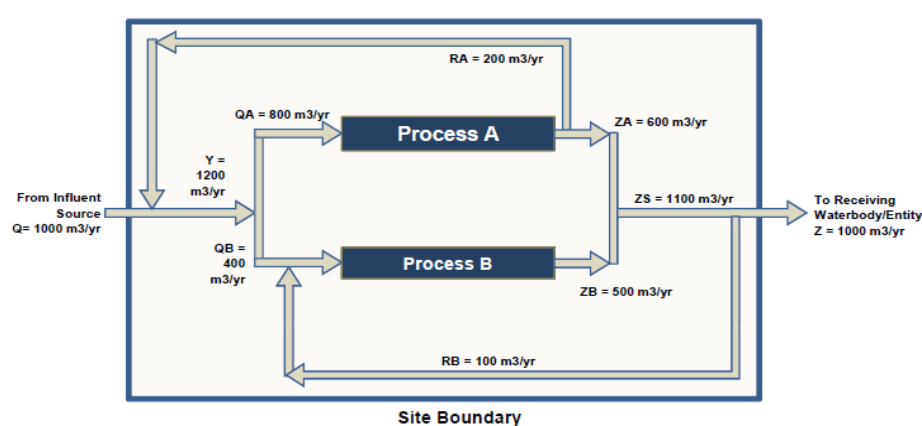
**Recycled/Reused water (%):** Total of Recycled and Reused Water as a percentage of Total Water Withdrawal.

### Volumetric Flowrate Definition for Water Recycling/Reuse

In example below:

Water Recycling/Reuse Flowrate =  $RA + RB = 300 \text{ m}^3/\text{yr}$

Water Recycling/Reuse (%) =  $(RA + RB)/Q = 30\%$



Note: Assumes no losses from Process A or Process B

**Refining Operations:** The activities of a company to convert hydrocarbons or biofuels into fuel, lubricants, asphalts and other derivatives.

**Reinjection:** Injection of produced water back into the reservoir for pressure maintenance for further production.

**Reporting:** Disclosing relevant information and data to internal and external stakeholders such as management, employees, governments, regulators, shareholders, the general public, local communities or specific interest groups.

**Reservoir:** term used to signify an underground volume of gas and/or liquid.

**Retail Operations:** The activities of a company to sell products and services at commercial stations.

**Reused water:** The amount of used water/wastewater employed in another function in a lower use in the process cycle before discharge for final treatment and/or discharge to the environment. Reuse includes wastewater used for irrigation within a facility boundary. Reuse includes harvesting of rainwater within a facility.

**Risk:** A company's risk from using water from a particular water source is defined as potential business liabilities faced by the site as a result of impacts and external water-related drivers and constraints. "Risk" in this tool is not synonymous with a specific regulatory or financial reporting requirement such as that required by the U.S. Securities and Exchange Commission.

**Site:** A unique location of a business operation.

**Source: Origin of water withdrawal**



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**Stress:** The tension resulting from the imbalance of insufficient supply and strong demand.

**Subsurface Discharge:** Effluent discharge point below ground. The receiving entity may be disposal to a closed saline/non-freshwater body or it may be injected to a freshwater aquifer that is used by others.

**Surface water:** Water that flows over or is stored on the ground surface.

**Total Dissolved Solids (TDS):** Total weight of dissolved mineral constituents in water per unit volume of water in the sample. Measurement unit: mg/l.

**Total Petroleum Hydrocarbons (TPH):** any mixture of hydrocarbons that are found in crude oil or gas. Chemicals that occur in TPH include hexane, benzene, toluene, xylenes, naphthalene, and fluorene, other constituents of gasoline, of jet fuels, of mineral oils, and of other petroleum products.

**Turbidity:** Condition of a liquid due to fine, visible material in suspension, which impedes the passage of light through the liquid. The units of turbidity from a calibrated nephelometer are called Nephelometric Turbidity Units (NTU).

**Water consumption:** per Calculation Methodologies below, water consumption is the difference between water withdrawal and water discharge. Consumption removes water from a water system and makes it unavailable for further use.

**Water discharge:** Water effluents discharged outside a reporting organization boundary to subsurface waters, surface waters, sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and groundwater.

**Water withdrawal (or use):** The sum of all water drawn into the boundaries of the reporting organization from external sources.

**Water intensity:** The ratio between water withdrawal or water consumption and a defined unit of production

**Watershed:** Area having a common outlet for its surface runoff. Synonyms include: catchment, drainage area, and river basin.

### Calculation Methodologies

#### A) Freshwater Withdrawal and Consumption

##### **1) Total freshwater withdrawal (A1):**

The sum of all freshwater drawn into the boundaries of the reporting organization from the following sources for any use over the course of the reporting periods:

- Surface water
- Groundwater
- Municipal supply (including potable water purchased from other industries).
- External wastewater
- Produced water from a company's own operations
- Rainwater and precipitation captured by the Site

##### **2) Total Freshwater Consumed by Facility (A3):**

The quantity of freshwater:

- Evaporated for cooling purposes
- Evaporated from water storage facilities
- Lost via transmission
- Used directly in the organization's products
- Onsite uses, including water lost in re-injection for oil or gas production, irrigation and road maintenance

Freshwater consumption is the difference between freshwater intake and freshwater discharge. Consumption removes water from a water system and makes it unavailable for further use.

#### B) Non-Freshwater Withdrawal and Consumption

##### **1) Total Non-Freshwater Withdrawal (B1):**

The sum of all non-freshwater drawn into the boundaries of the reporting organization from the following sources for any use over the course of the reporting periods:

- Seawater
- Surface water – brackish or saline source
- Groundwater and produced water – brackish or saline source
- External wastewater – untreated or partially treated wastewater from municipal or other external industrial source

##### **2) Total Non-Freshwater Consumed by Facility (B2):**

The quantity of non-freshwater:

- Evaporated for cooling purposes



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- b) Evaporated from water storage facilities
- c) Lost via transmission
- d) Onsite uses, including water lost in re-injection for oil or gas production, irrigation and road maintenance

Non-Freshwater consumption is the difference between non-freshwater intake and non-freshwater discharge. Consumption removes water from a water system and makes it unavailable for further use.

### C) Total Water Withdrawal and Consumption

#### **1) Total Water Withdrawal (Meets GRI EN8 Definition) (C1):**

The sum of Total Freshwater Withdrawal and Rainfall (A2) and Total Non-Freshwater Withdrawal (B1) for any use over the course of the reporting period.

#### **2) Total Water Consumed by Facility (C2):**

The quantity of fresh (A3) and non-freshwater (B2):

- a) Evaporated for cooling purposes
- b) Evaporate from water storage facilities
- c) Lost via transmission
- d) Used directly in the organization's products
- e) Onsite uses, including water lost in re-injection for oil or gas production, irrigation and road maintenance

### D) Freshwater Discharge

#### **1) Freshwater Discharge (D1):**

Water effluents from fresh sources (A3) discharged outside a reporting organization boundary over the course of the reporting period to subsurface waters, surface waters, sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and groundwater through:

- A defined discharge point (point source discharge) – including sales of water to an external facility
- Over land in a dispersed or undefined manner (non-point source discharge)
- Wastewater removed from the reporting organization via truck

Discharge of collected rainwater and domestic sewage are regarded as wastewater discharge.

### E) Non-Freshwater Discharge

#### **1) Total Water Discharge (relevant to GRI EN 21 – but Not Exactly Same) (E1):**

Water effluents from non-freshwater sources (B2) discharged outside a reporting organization boundary over the course of the reporting period to subsurface waters, surface waters, sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and groundwater through:

- A defined discharge point (point source discharge) – including sales of water to an external facility
- Over land in a dispersed or undefined manner (non-point source discharge)
- Wastewater removed from the reporting organization via truck

Discharge of collected rainwater and domestic sewage are regarded as wastewater discharge.

### F) Total Water Discharge

#### **1) Total Water Discharge (GRI EN 21) (F1):**

The sum of fresh (D1) and non-freshwater (E1) effluents discharged outside a reporting organization boundary over the course of the reporting period to subsurface waters, surface waters, sewers that lead to rivers, oceans, lakes, wetlands, treatment facilities, and groundwater through:

- A defined discharge point (point source discharge) – including sales of water to an external facility
- Over land in a dispersed or undefined manner (non-point source discharge)
- Wastewater removed from the reporting organization via truck

Discharge of collected rainwater and domestic sewage are regarded as wastewater discharge.

(Note: this definition includes rainwater and domestic sewage. GRI EN21 does not include these.)

### G) Internal Recycling and Reuse

#### **1) Recycling (G1):**

The amount of used water/wastewater employed through another cycle back in the same process or in a higher use in the process cycle before discharge for final treatment and/or discharge to the environment.

#### **2) Reuse (G2):**

The amount of used water/wastewater employed in another function in a lower use in the process cycle before discharge for final treatment and/or discharge to the environment. Reuse includes wastewater used for



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irrigation within a facility boundary. Reuse includes harvesting of rainwater within a facility boundary.

**3) Total Recycled and Reused Water (Meets GRI EN10 with G4) (G3):**

The total amount of recycled (G1) and reused (G2) water/wastewater.

**4) Percentage of Total Recycled and Reused Water (Meets GRI EN10 with G3) (G4):**

The Total Recycled and Reused water (G3) as a percentage of Total Water Withdrawal (C1).