CDP Water Disclosure 2011 Information Request
Anadarko Petroleum Corporation

Module: Introduction - 2011 CDP Water Disclosure

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0.1
Introduction

Please give a general description and introduction to your organization.

Anadarko Petroleum Corporation is pleased to respond to the CDP Water Project and continues to support the Carbon Disclosure Project. Anadarko's mission is to deliver a competitive and sustainable rate of return to shareholders by exploring for, acquiring and developing oil and natural gas resources vital to the world's health and welfare. As of year-end 2009, the company had approximately 2.3 billion barrels-equivalent of proved reserves, making it one of the world's largest independent exploration and production companies. For more information about Anadarko, please visit http://www.anadarko.com.

0.2
Reporting Year
Please state the start and end date of the year for which you are reporting data.

Enter the period that will be disclosed.
Fri 01 Jan 2010 - Fri 31 Dec 2010

0.3
Reporting Boundary

Please indicate the category that describes the company, entities, or group for which you are reporting.

Companies over which operational control is exercised

0.4
Exclusions

Are there any geographies, activities, facilities or types of water inputs/outputs within this boundary which are not included in your disclosure?

No

Further Information

Module: 2011-Water-Management

Page: 2011-Water-1-ManagementGovernance

1.1
Does your company have a water policy, strategy or management plan?

Yes

1.1a
Please describe your policy, strategy or plan, including the highest level of responsibility for it within your company and its

geographical reach

Geographical reach	Description of policy, strategy or plan	Position of responsible person
Global	Anadarko is committed to conducting our business activities in a manner that protects the environment, and minimizes our impact on the land, air and water. Our strategy for managing water-related issues is implemented at multiple levels: Anadarko is undertaking a rigorous macro-level analysis of the company's water management program in order to inform decisions about water-related issues and to enhance our water management, conservation and recycling programs. Water management is also sub-divided by region: Southern, Rockies, Gulf of Mexico, and International/Frontier. Current international operations are in the following regions: Brazil, China, Indonesia, New Zealand, Algeria, East Africa and West Africa. Frontier refers to operations in Alaska. Water-related issues are also assessed and managed at the watershed level. Environmental impact is a particular concern at this level. Potential impacts to watersheds and water sources are also analyzed on a per-project basis. Anadarko's Legal, Regulatory, and EHS (Environment, Health and Safety) departments monitor current and future issues related to water risk and management. Our management strategy includes tracking total water volume used in our operations; sources of water (surface, groundwater, municipal, etc); volume of water recycled; volume of water discharged; and volume of water injected. Anadarko is undertaking a rigorous analysis of our water management practices, performance and opportunities for improvements in water use efficiency. We were among the first to implement comprehensive water recycling programs in our Rockies and Southern regions, and we constantly evaluate opportunities to expand these programs to other assets around the world. We comply with local, state, regional and federal requirements regarding water quality, wastewater treatment and the protection of watersheds. Also, as part of our goal to be a leader in environmental stewardship, when operating internationally we implement standards that are more stringent than the host nation's requirements as much as possible, and require that our contractors meet those standards as well. Hydraulic fracturing regulations to protect water sources are closely tracked by the company's Enterprise Risk Management function.	Officer/manager reporting directly to the board

1.1b

Does the policy, strategy or plan specify water reduction, quality or efficiency targets or other water-related goals?

Yes

1.1c

Please describe these water-related targets or goals

Geographical reach	Type of target/goal	Target/goal	Additional information
Global	Efficiency	As described above, Anadarko has put in place strategies to increase water-related efficiency and conservation, and we have taken the necessary first steps toward these objectives. Our actions include tracking water use to establish a robust baseline regarding key water metrics including total water volume used in our operations; sources of water (surface, groundwater, municipal, etc); volume of water recycled; volume discharged; and volume injected. From this baseline, we will be able to measure the impact of our newly initiated water recycling and conservation programs, helping us accomplish our objectives and expand these programs company-wide. This will also provide a context to inform our current analysis of water-related risk throughout our operations.	
Global	Quality of discharges	Additionally, we comply with local, state, regional and federal requirements regarding water quality, wastewater treatment and the protection of watersheds. As part of our commitment to be a leader in environmental stewardship, when operating internationally we undertake a comprehensive bridging process to assess differences between company, contractor and national standards, including those related to water. To the greatest extent feasible, we implement	

		standards that are more stringent than the host nation's requirements, and require that our contractors meet those standards as well.	
Global	Other: Stewardship	Our Environment, Health and Safety (EHS) policy states that we strive to be a recognized industry leader in environmental stewardship. We have demonstrated that leadership through numerous awards and recognitions as well as being a founding member of both the American Carbon Registry and The Climate Registry. Consistent environmental policies are implemented across the corporation.	

1.2

What specific actions has your company taken to manage water resources or engage stakeholders in water-related issues?

Geographical reach	Type of action	Action	Outcomes
US	Direct operations	Water Management and Conservation Local aquifers must be protected, and we are committed to constructing our wells in a manner that often exceeds regulatory requirements and industry standards. In the drilling of wells across our U.S. onshore operating areas, we require that multiple protective layers of steel pipe, also called casing, and cement be set several hundred feet below the deepest known aquifer and cemented all the way to the surface. The cement must meet certain quality requirements and extend the full length of the casing. These redundant protective boundaries are put in place to establish wellbore integrity. Additionally, the casing is pressure tested, the cement's quality and placement is checked, and pressure gauges are installed to monitor the well for mechanical integrity once production begins.	
Pennsylvania	Direct operations	In the Marcellus Shale, Anadarko's water-management and well-completion strategies strive to reduce truck traffic and associated emissions, while minimizing earth disturbance and conserving available water resources. A creative piping system using two lines, one for natural gas and one for fresh water (located in the same trench) provides water to well sites for the completion process. The closed-loop system moves water from a pre-determined and approved source through pipelines to containment facilities for use in the fracture-stimulation process. Anadarko has employed the use of temporary earthen impoundments and portable, above-ground holding ponds (PortaDams) to store water required for completion operations. The flowback water from operations is produced into steel tanks and treated on site using newly developed water filtration and recycling technologies. The flowback water that is recovered is then recycled and reused in future operations. Additionally, we collect drill cuttings, or pieces of earth that return to the surface in the drilling operations, in steel containers until they can be properly tested and disposed of in accordance with all regulations.	
Utah	Direct operations	In the Greater Natural Buttes area, Anadarko was recognized by the Utah Division of Oil, Gas and Mining with its 2010 Earth Day Award, and by the Interstate Oil & Gas Compact Commission with its 2010 Chairman's Award for the Anadarko Completions Transportation System (ACTS) This creative water-management program creates temporary staging sites on existing natural gas well locations that treat recycled flowback water that is used for fracture stimulation and move the filtered water directly to the next operation via temporary pipelines. These pipelines use existing pad locations and rights of way that minimize additional surface disturbance, truck traffic and associated emissions.	
Wyoming	Direct operations	We constructed a 48-mile water pipeline that transports produced water from our coalbed methane operations in the Powder River Basin south to our Salt Creek field where it is stored in underground aquifers that match the quality of the produced water so it can potentially be used in the future.	
Worldwide	Direct operations	We measure the following: Water consumption in all hydraulic fracturing operations; Water discharge volumes to surface at select operations; All water injected; Quality of water discharge in all operations; Produced water in all operations; and Water recycled at select operations.	

Mozambique	Community engagement	Anadarko has installed drinking water wells to increase access to freshwater in developing countries.	
USA	Transparency	Anadarko supports the public disclosure of information regarding additives used in hydraulic fracturing. Anadarko was instrumental in initiating and developing a voluntary hydraulic fracturing disclosure Website to provide ingredients used in hydraulic fracturing to the public on a per-well basis. The Website was a collaboration among producers, the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission. Anadarko took a leading role in designing and coordinating this Website and is among the most active participants. The Website may be viewed at http://fracfocus.org/	

Further Information

Hydraulic fracturing is the use of fluid and material to create or restore small fractures in a formation in order to stimulate production from new and existing oil and gas wells. This creates paths that increase the rate at which fluids can be produced from the reservoir formations. The process includes steps to protect water supplies. Anadarko requires that multiple protective layers of steel pipe, also called casing, and cement be set several hundred feet below the deepest known aquifer and cemented all the way to the surface. The cement must meet certain quality requirements and extend the full length of the casing. These redundant protective boundaries are put in place to establish wellbore integrity. Additionally, the casing is pressure tested, the cement's quality and placement is checked, and pressure gauges are installed to monitor the well for mechanical integrity once production begins. With these and other precautions taken, fracturing fluids are pumped deep into the well at pressures sufficient to create or restore the small fractures in the reservoir rock needed to make production possible. The ingredients used in fracture-stimulation fluids vary according to geology. In general terms, water makes up more than 90 percent of the solution; sand or proppant constitutes approximately 9 percent; and additives make up less than 1 percent of the total volume. The relatively small amounts of additives generally consist of friction reducers, biocides to prevent bacterial development, and scale inhibitors. We have disclosed the chemicals used for each well on a publicly accessible website: fracfocus.org. Fluid Storage – "Pits" Pits can be excavated holes in the ground, or they can be above ground containment systems such as steel tanks. Pits are used for storage of produced water, for emergency overflow, temporary storage of oil, and for temporary storage of the fluids used to drill, complete and treat the well. The containment of fluids within a pit is the most critical element in the prevention of contamination of shallow ground water. The failure of a tank, pit liner, or the line carrying fluid ("flowline") can result in a release of contaminated materials directly into surface water and shallow ground water. Furthermore, in areas with shallow groundwater and/or permeable soils, earthen pits are constructed with impermeable liners to prevent vertical migration of pit fluids. Fluid Handling and Disposition Following hydraulic fracturing, fluids returned to the surface within a specified length of time are referred to as flowback. Besides the original fluid used for fracturing, flowback can also contain fluids and minerals that were in the fractured formation. The responsibility for regulating wastes such as flowback fluid lies with one or more state regulatory agencies, depending on the state. In at least 9 states, the jurisdiction over waste management for oil and gas exploration and production activity involves more than one agency. Proper disposal of flowback fluids is critically important to the protection of both surface and ground water. The majority of flowback fluids are disposed of in underground injection wells. Injection of flowback fluids is conducted in a Class II injection well. Underground injection of flowback is regulated by either the U.S. Environmental Protection Agency's (EPA) Underground Injection Control (UIC) program or by a state granted primary UIC enforcement authority by the EPA.

Module: 2011-Water-RisksOps

Page: 2011-Water-2-indicators-op

2.1
Are you able to identify which of your operations are located in water-stressed regions?

Yes

2.1a
Please specify the method(s) you use to characterize water-stressed regions

Method used to define water stress	Please add any comments here:
Environmental assessment Internal	We utilized the EarthTrends database to assess areas of our operations that may be located in water-stressed regions. EarthTrends is a comprehensive online database maintained by the World Resources Institute that focuses on environmental, social, and economic trends. According to the EarthTrends Water Poverty Index, all

company knowledge WRI water scarcity definition	of our operated international projects are located in regions that have adequate water supplies per capita. Domestically EarthTrends indicates that the locations where we operate in the Rockies may be affected by water-stress. Internal assessments also indicate that the Eagle Ford Shale in south Texas may also be subject to water-stress as a result of current drought conditions.

2.1b

Please list the water-stressed regions where you have operations and the percentage of your total operations in that area

Country	Region within country	Proportion of operations located in this region (%)	Further comments
United States of America	Rockies	31 – 40	
United States of America	Eagle Ford, TX	0 – 10	

2.2

Do you use other indicators (besides water stress) to identify operations which are located in regions subject to water-related risk?

Yes

2.2a

Please list the regions at risk where you have operations, the relevant risk indicator and percentage of your total operations in that area

Country	Region within country	Proportion of operations located in this region (%)	Indicator
Other: International		21 – 30	Physical risk due to poor infrastructure
Other: Worldwide		91 – 100	Legal
Other: Worldwide		91 – 100	Regulatory
Other: Worldwide		91 – 100	Reputation

2.3

Please specify the total percentage of your operations that are located in the regions at risk which you identified in questions 2.1 and/or 2.2

100%

2.4

Please specify the basis you use to calculate the percentages used for questions 2.1 and/or 2.2

Basis used to determine percentage	Please add any comments here
Revenue	

Further Information

Because we understand that water is a precious resource, we consider water-related risk to be a factor in all our operations. That is why we analyze risks related to the availability of water, potential impact on watersheds and water sources, legal and regulatory issues, and stakeholder concerns for all plays. The level and type of risk varies by region and activity. For example: - Drought conditions in Texas, Wyoming, and Utah have the potential to reduce the availability of water. - Hydraulic fracturing operations in Pennsylvania are currently the subject of public controversy and regulatory scrutiny. - Access to water in developing countries may be limited by a lack of physical infrastructure. - Potential impacts to water sources and watersheds must be assessed and managed.

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2.5

Are you able to identify which of your key water-intensive inputs (excluding water) come from regions subject to water-related risk?

No

2.5b

You may explain here why you are not able to identify which of your key water-intensive inputs come from water-stressed regions and whether you have plans to explore this issue in the future

We are reviewing these concerns, although currently we do not have information regarding water-intensive inputs throughout the supply chain.

Further Information

Page: 2011-water-3-riskassess-op

3.1

Is your company exposed to water-related risks (current or future) that have the potential to generate a substantive change in your business operation, revenue or expenditure?

Yes

3.1a

Please describe the current and/or future risks to your operations, the ways in which these risks affect or could affect your operations and your current or proposed strategies for managing them

Country or geographical reach	Risk type	Risk description	Timescale (years)	Potential business impact	Risk management strategies
United States of America	10. Regulatory: Regulatory uncertainty	Increased regulatory standards for hydraulic fracturing	Current	Increased cost to operations	Effective policy analysis and involvement in legislation/regulatory rule/law-making Dedicated pre-compliance preparation for requirements as well as robust compliance assurance
United States of America	16. Other: Reputational damage	Public perceptions of hydraulic fracturing chemicals and risk of water pollution	Current	Reputation risk could lead to increased regulatory oversight, fewer exploration opportunities and/or project delays	Efficient and focused external stakeholder engagement with local communities, state and federal agencies, NGOs, and resident groups that begins with project conception continues through the life and decommissioning of the producing well
United States of America	11. Regulatory: Statutory water withdrawal limits/changes to water allocation	Increased regulatory standards for groundwater withdrawal by local water districts	Current	Regulatory risk could lead to project delays due to limited water sources and permitting requirements	Effective policy analysis and involvement in legislation/regulatory rule/law-making. Dedicated pre-compliance preparation for requirements as well as robust compliance

					assurance
United States of America	03. Physical: Increased water stress or scarcity (leading to e.g. disruption to operations, higher commodity/energy prices)	Possible restricted access to groundwater withdrawal depending on future drought conditions	1 – 5	Possible restrictions on groundwater withdrawal could lead to project delays	Anadarko is assessing ways to improve water efficiency
Other: Worldwide	16. Other: Reputational damage	Industry risk regarding potential pollution or contamination from spills or water disposal activities	Current	Reputational damage could impact our ability to do business in certain areas	Stakeholder engagement and continuous focus on safety and environmental impact minimizes this risk
Other: Worldwide	10. Regulatory: Regulatory uncertainty	Possible increased regulatory standards for environmental impact management and spill prevention, especially in the wake of the recent BP oil spill in the Gulf of Mexico	Current	More stringent regulatory standards could cause project delays and increase costs. Additionally, we were forced to stop all operations in the Gulf of Mexico during a lengthy moratorium while regulations were under review	Effective policy analysis and involvement in legislation/regulatory rule/law-making. Dedicated pre-compliance preparation for requirements as well as robust compliance assurance
Other: Worldwide	14. Other: Litigation	Possible litigation or fines for spills or contamination	Current	Litigation and associated legal fees or fines related to water contamination is potentially costly to company	Continuous focus on safety and environmental impact minimizes this risk
Other: Developing Countries	17. Other: Inadequate infrastructure (leading to disruption in operations)	Limited infrastructure could hinder access to water	1 – 5	Anadarko's operations in developing countries are increasing. Future international production could be affected by limited infrastructure	Continual assessment of existing water supplies and infrastructures in areas of exploration

3.2

What methodology and what geographical scale (e.g. country, region, watershed, facility) do you use to analyze water-related risk across your operations?

Risk methodology	Geographical scale
Analysis of water-related risk is undertaken at multiple levels. A macro-level analysis of water-related risk informs decisions about water-related activities. The methodology used for this analysis begins with an information-gathering process to establish baseline activities company-wide. This information is then used to consider water-related risk as part of our enterprise risk management function. Hydraulic fracturing is already analyzed in our enterprise risk management. Risk analysis and management is also sub-divided by region. Regional analysis includes taking into account such issues as water stress, water availability, regional and local regulations, and stakeholder concerns. Water-related risk is also analyzed at the watershed level. Environmental impact is a particular concern at this level. Site surveys and sampling are used to collect baseline data in order to analyze potential impacts. Water-related risk is analyzed on a per-project basis. One methodology used for this level of analysis is the EIA and EIS. Anadarko's Legal, Regulatory, and EHS (Environment, Health and Safety) departments monitor current and future issues related to water risk and management.	Other: Multiple levels

Further Information

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3.3
Do you require your key suppliers to report on their water use, risks and management?

No

3.4
Is your supply chain exposed to water-related risks (current or future) that have the potential to generate a substantive change in your business operation, revenue or expenditure?

Don't know

3.4c
Please explain why you do not know if your supply chain is exposed to any water-related risk and if you have plans to assess this risk in the future

Though we have not undertaken a thorough analysis of water-related risks throughout the supply chain, our supply chain is likely subject to similar risks as our company and throughout the oil and gas industry.

Further Information

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4.1
Please describe any detrimental impacts to business related to water your company has faced in the past five years, their financial impacts and whether they have resulted in any changes to company practices

With regard to hydraulic fracturing, the uncertain regulatory environment and changes in regulatory requirements increases costs and causes delays in our operations. In response, Anadarko has committed to improving transparency around hydraulic fracturing to dispel public concerns. The BP oil spill in the Gulf of Mexico in 2010 increased the public's awareness and skepticism of deepwater drilling and the ability to respond to and contain a similar event in the future. A government-imposed moratorium on drilling in the Gulf, a more stringent regulatory environment, and reputational damage to the oil and gas industry have impacted the company's ability to operate in this core area, to date.

Further Information

Page: 2011-Water-5-Opportunities

5.1
Do water-related issues present opportunities (current or future) that have the potential to generate a substantive change in your business operation, revenue or expenditure?

Yes

5.1a
Please describe the current and/or future opportunities, the ways in which these opportunities affect or could affect your operations and your current or proposed strategies for exploiting them

Country or geographical	Opportunity	Timescale	Potential business impact	Strategy to exploit opportunity

reach	description			
Other: Worldwide	Financial - reduced disposal costs	6 – 10	Innovative recycling and treatment could reduce costs of disposal	We are currently assessing technologies and opportunities for water recycling and treatment
Other:	Financial -- reduced purchasing costs	6 – 10	Innovative recycling and treatment could reduce the amount of water purchased for operations	We are currently assessing technologies and opportunities for water recycling and treatment

Further Information

Page: 2011-Water-6-tradeoffs

6.1

Has your company identified any linkages or trade-offs between water and carbon emissions in its operations or supply chain?

Yes

6.1a

Please describe the linkages or trade-offs and the related management policy or action

Linkage or trade-off	Policy or action
Hydraulic Fracturing for Deep Shale Natural Gas The company is increasing its exploration and production of deep shale natural gas reserves. The proven and advancing technology of hydraulic fracturing combined with horizontal drilling techniques make it possible to access previously unavailable natural gas in shale formations. Natural gas is clean-burning and because of the advent of shale plays, it is now considered domestically abundant. Although the development of shale gas requires large amounts of water, studies have shown the amounts are smaller on a relative basis when compared to the water-requirements of other industrial uses, and the benefits of natural gas are far reaching. These include reducing the carbon footprint of energy use and reducing the country's dependence on foreign oil provide.	In order to manage trade-offs between water use and access to clean energy, we are investing in water recycling and treatment programs. We have implemented water recycling programs in our Rockies and Southern regions, and we are investigating expanding these programs in other areas of operation. Fluid Recycling Advances in flowback fluid recycling and treatment technology offer the promise of using flowback fluid for other purposes, rather than simply disposing of it. The use of filtration, reverse osmosis, decomposition in constructed wetlands, ion exchange and other technologies may eventually result in the widespread practice of using flowback fluids for such things as managed irrigation and land application. One practice in use today is the recycling of flowback fluids for their reuse in other hydraulic fracturing jobs, which saves water. Anadarko recycles flowback fluids in its hydraulic fracturing operations in Pennsylvania, Wyoming, and Utah. We are investigating similar programs in our other areas of operation.
Water Used for Oil and Gas Production Compared to Other Energy Sources As demonstrated by a report titled "The Environmental Cost of Energy" by the American Energy and Environmental Research Foundation, the amount of water required to access deep shale gas by the hydraulic fracturing process (water intensity) is actually less than other energy sources, and much less than the production of alternative energy sources such as fuel ethanol (irrigated corn), biodiesel (irrigated soy), and hydropower (see chart below).	

Further Information

Attachments

https://www.cdproject.net/Sites/2011/45/745/CDP Water Disclosure 2011/Shared Documents/Attachments/CDPWaterDisclosure2011/ManagingTrade-offsbetweenWaterandCarbonEmissions/water and energy.jpg

Module: 2011-Water-Account

Page: 2011-Water-7-Withdrawals

7.1
Are you able to provide data, whether measured or estimated, on water withdrawals within your operations?

Yes

7.1a
Please report the water withdrawals within your operations for the reporting year

Country or geographical reach	Withdrawal type	Quantity (ML/yr)	Proportion of data that has been verified (%)	Comments
Other: Worldwide	Other: Surface water, groundwater, municipal water	80380	0 – 25	Proportion verified is 5%

7.2
Are you able to provide data, whether measured or estimated, on water recycling/reuse within your operations?

Yes

7.2a
Please report the water recycling/reuse within your operations for the reporting year

Country or geographical reach	Quantity (ML/yr)	Proportion of data that has been verified (%)	Comments
Other: Worldwide	1132	0 – 25	Proportion verified is <1%

7.3
Please use this space to describe the methodologies used for questions 7.1 and 7.2 or to report withdrawals or recycling/reuse in a different format to that set out above

7.4
Are any water sources significantly affected by your company's withdrawal of water?

No

7.4b
You may explain here why your company's withrawal of water does not significantly affect any water sources

Further Information

Page: 2011-Water-8-Discharges

8.1
Are you able to identify discharges of water from your operations by destination, by treatment method and by quality using standard effluent parameters?

Yes

8.2
Did your company pay any penalties or fines for significant breaches of discharge agreements or regulations in the reporting period?

No

8.3
Are any water bodies and related habitats significantly affected by discharges of water or runoff from your operations?

No

8.3b
You may explain here why your company's discharge of water does not significantly affect any water bodies or related habitats

Further Information

Page: 2011-Water-9-Intensity

9.1
Please provide any available financial intensity values for your company's water use across its operations

Country or geographical region	Financial metric	Water use type	Financial intensity (US$/ML)	Please provide any contextual details that you consider relevant to understand the units or figures you have provided.
Other: Worldwide	Revenue	Water use in operations	124520	

9.2
Please provide any available water intensity values for your company's products across its operations

Country or geographical reach	Product	Product unit	Water use type	Water unit	Water intensity (Water unit/product unit)	Please provide any contextual details that you consider relevant to understand the units or figures you have provided.
Other: Worldwide	Oil & Natural Gas - Barrels of Oil Equivalent (BOE)	Other: Barrels	Water use in operations	Other: Barrels	2.2	BOE is the sum of natural gas produced converted to a barrel equivalent (5,200 cubic feet/barrel) plus liquid

Further Information

CDP