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## **AWS INTERNATIONAL WATER STEWARDSHIP STANDARD**

### **GUIDANCE ON SPECIAL SUBJECT: CATCHMENTS**

#### **DRAFT DATED 31 AUGUST 2018**

Knowing the organization's catchment is critical to effective water stewardship

With Incomplete or incorrect knowledge of the catchment:

- Important risks may be missed - to the organization, or from the organization to others
- It may result in failure to identify critical stakeholders,
- It may result in focusing disproportionate cost and effort on the 'wrong' geography and/or stakeholders.

The water catchment is the physical zone around the site which provides its water supply (upstream) and where its run-off and wastewater go (downstream). The site's water supply – quantity and/or quality – may be impacted by what happens upstream, and its actions may impact on the downstream, including other water users and the natural environment. Upstream and downstream activities may overlap.

Examples of impacts from an upstream catchment:

- Pollution from industry or agriculture contaminates the water supply
- High rates of water use by others reduces the water available to the organization
- Heavy rainfall causes flooding of the site

Examples of impacts from the site to the downstream catchment:

- Water use reduces what is available to others
- Wastewater contaminates natural water bodies or the water supply of others
- Removal of vegetation from the land increases run-off rates after heavy rain, increasing flood risk to downstream properties

A water supply originates from either **surface water** or **groundwater**. Surface and groundwater catchments differ in their boundaries and characteristics. A minimum level of expertise is required to reliably define the catchment, especially for groundwater.

#### **Surface water catchment**

A surface water catchment is defined by the topography of the land. The boundary is the line of highest ground around a river basin, defined from topographical maps or satellite studies. The boundary is easy to define where river basins are separated by mountain ranges or hills, but more difficult in flatter landscapes. The boundary of a surface water catchment does not change (except over geological time scales).

All precipitation (rain or snow) falling within the boundary flows down slope towards the principal river, as run-off and along its tributary streams and rivers. A proportion is lost to evaporation and take-up by plants (collectively evapotranspiration), infiltration to the ground and to water users. In arid climates, evaporation is so high that no surface water remains (although groundwater may still be significant). Where there are significant human interventions, such as canals, water flows may be significantly modified, and include transfers between catchments.

Surface water is replenished from direct precipitation, run-off and out-seepage of groundwater.

## Groundwater catchment

Groundwater is stored in, and moves through, permeable geological layers known as aquifers via interconnected voids or pore spaces (its porosity).

Some groundwater catchment boundaries are fixed (by a geological boundary) and some movable. A movable boundary is defined by a 'groundwater divide' whose position can move due to seasonal effects or the impact of water abstractions.

Groundwater is replenished by infiltrating rainwater and surface water in 'recharge zones' where the aquifer is close to the surface. Groundwater naturally discharges to surface water or the sea.

## Interconnection of surface water and groundwater

Depending on the geological conditions, there may be strong interaction between surface water and groundwater, partial interaction, or complete separation.

Understanding the level of interconnection is essential to understanding the physical scope and water-related risks. Where there is strong interaction, impacts on surface water can also affect groundwater, and vice versa. There are also situations where there is *partial* interaction, for example, when a near surface and deep aquifer are separated by a semi-permeable geological layer. In these cases, the defined physical scope should include both surface and groundwater catchments.

## Visualization of catchments

[to include some illustrations of surface water and groundwater catchments]

## The scale of catchments - what size is relevant to a given site?

For effective water stewardship, the defined catchment scale and boundary must be relevant to the site's situation. For too small a catchment, important risks and stakeholders can be missed. For too large a catchment, there is a possibility of investing disproportionate effort and costs on low or negligible risks or non-relevant stakeholders.

Catchments range from a few square kilometers to many thousands. Aquifers range in thickness from a few meters to hundreds of meters. For a catchment that is very large, a site may need to identify a smaller portion (sub-catchment) that is relevant to its own scale of water use and discharges. However, it is important to remember that a major event in the main basin, such as a drought or large pollution spill, could still impact on the site water supply.

The starting point for the organization should be to identify the complete catchment. In many cases, however, this will be an unrealistically large area for the site to work with. For example, the Mississippi River Basin, which covers approximately half of the area of the United States, is far too large a catchment for any individual site. This can also be true for much smaller river basins (such as the Thames of south east England), and for large aquifers. In such cases, the site can define a more appropriate sub-catchment, justifying the reasons for doing so.

### **Box:**

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#### **When the catchment of relevance may be far from the site.**

When the site's water supply is provided by a third party, such as municipal supplier, it may be piped to the point of use over many kilometers, potentially from a physically separate catchment. The concept is similar for 'downstream' relevance when wastewater is piped to a distant wastewater facility. In these cases, the water supplier or wastewater utility are key stakeholders. The organization should understand how *they* manage and mitigate water risk.

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### **Box:**

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#### **Watershed and catchment terminology**

This box helps to clarify some of the different terminology conventions which can cause confusion.

**Surface catchment area**

<b>Term</b>	<b>Where used</b>	<b>Comment</b>
Surface water catchment	AWS, others	
Watershed	US English (and others)	
River catchment	UK English (and others)	
River basin	General	Also 'drainage basin'

**The boundary**

<b>Term</b>	<b>Where used</b>	<b>Comment</b>
Catchment boundary	AWS, others	
Divide	US English (and others)	
Watershed	UK English (and others)	Less commonly used due to confusion with US meaning
River basin boundary	General	
Groundwater divide	General	Flow boundary internal to a geological unit.

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