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**Detailed monitoring of groundwater quality near  
municipal solid waste landfills.  
Case-study in Valencia Region (Spain)**

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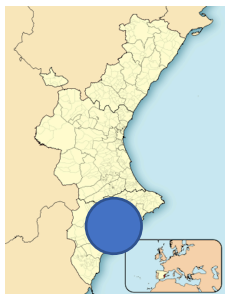
MSW landfills are one of the most relevant soil and groundwater pollution sources. Monitoring networks should be designed on the preliminary phases to guarantee that groundwater quality control is performed periodically over both the operation and post-closure phase of the landfill.

This work shows the results of a groundwater quality detailed monitoring campaign developed on a municipal solid waste landfill in Valencia Region (Spain). The sampling campaign included the continuous analysis over 11 boreholes of several parameters.

Despite there is no clear Spanish legislation concerning groundwater quality, results show that the evolution of groundwater quality over time is satisfactory, fulfilling the requirements of the American (USEPA) and European (Dutch) legislation standards.

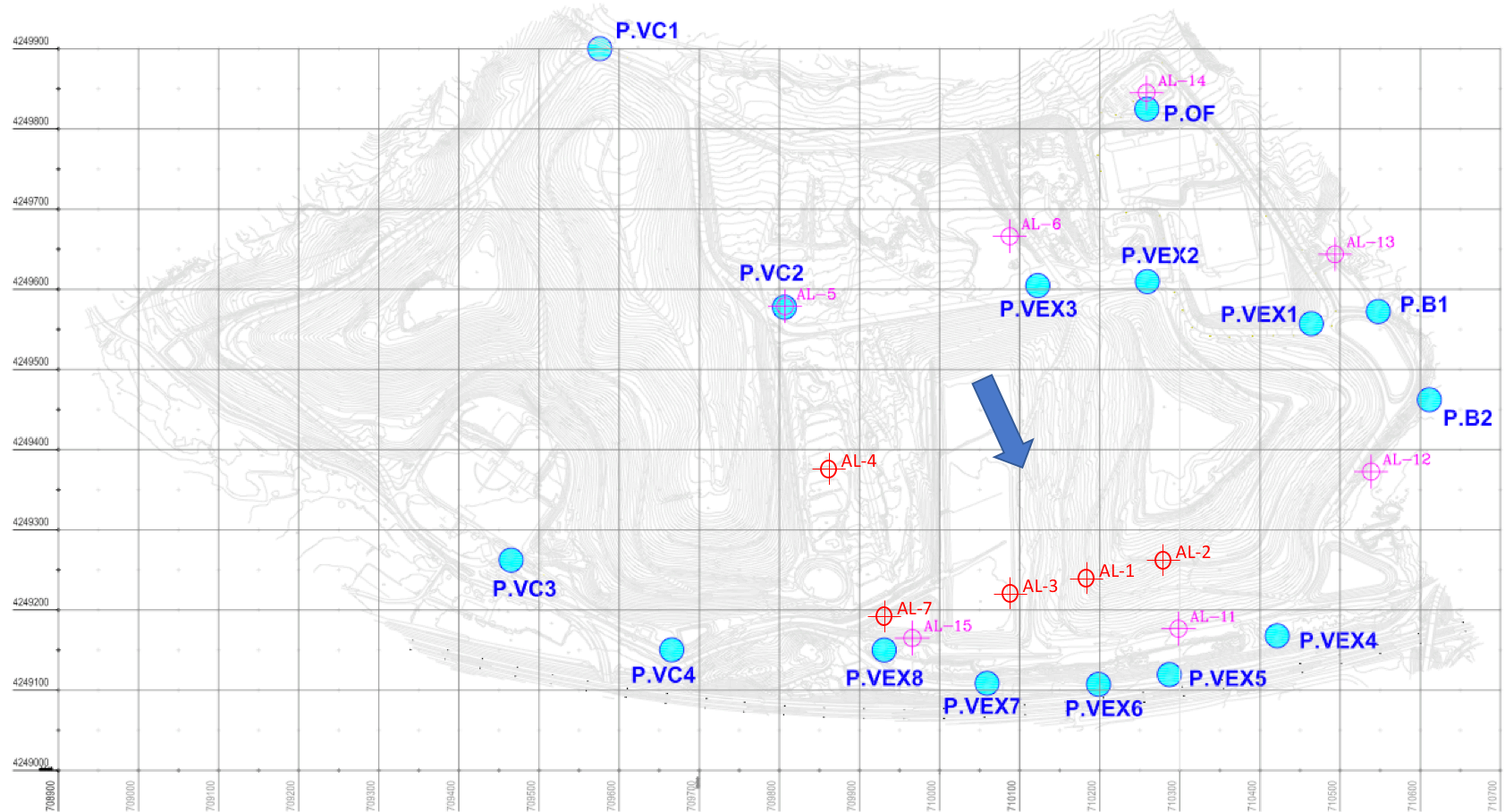
## Main technical characteristics of the landfill cells

	Capacity (m3)	Capacity (t)
Cell 1	609.013	365.408
Cell 2	1.214.033	728.42
Cell 3	1.578.449	947.069
Cell 4	1.214.084	728.451
Cell 5	3.111.179	1.866.708
<b>TOTAL</b>	<b>7.726.759</b>	<b>4.636.055</b>



Landfill location (Valencia Region – Spain)





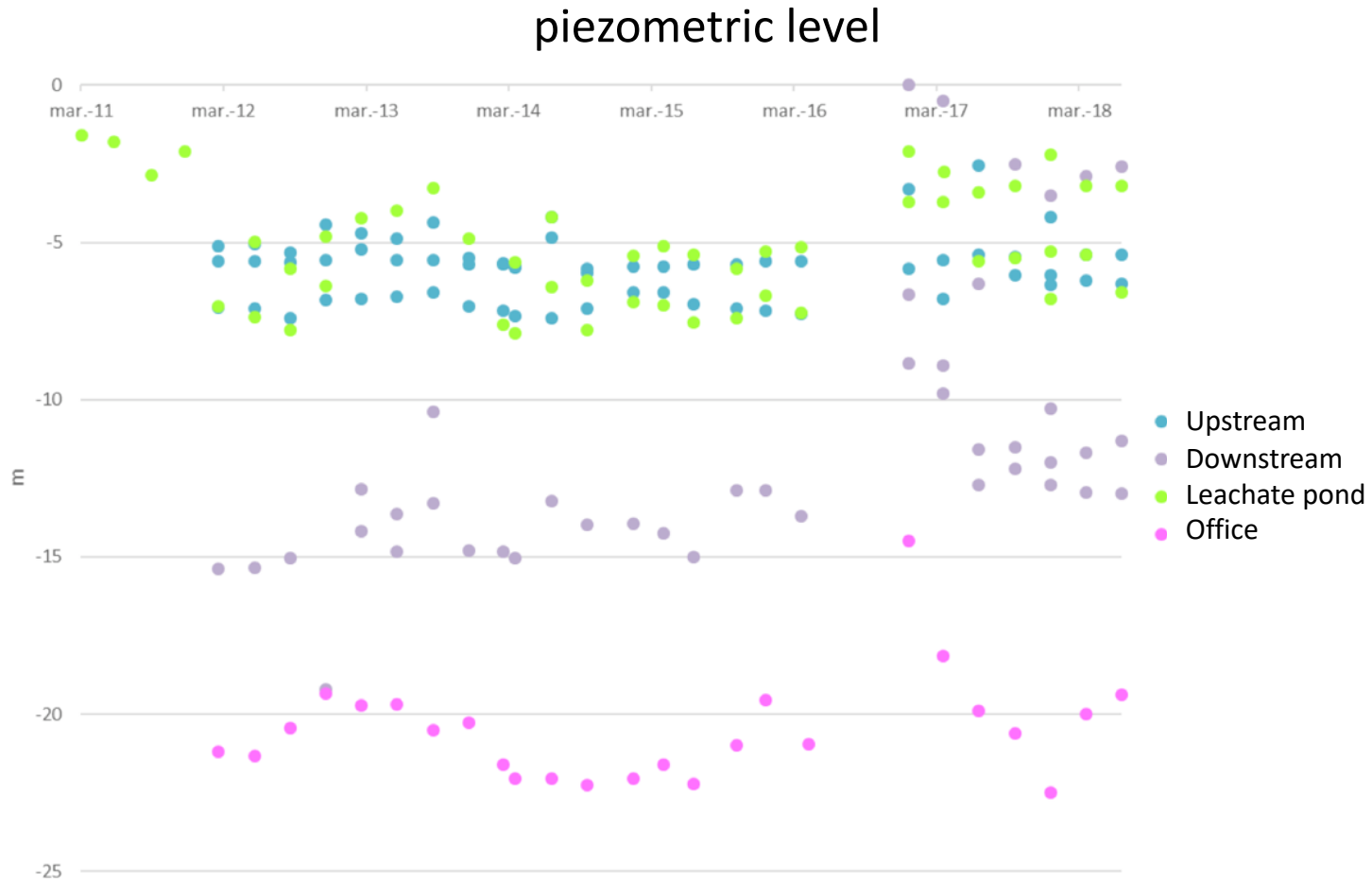


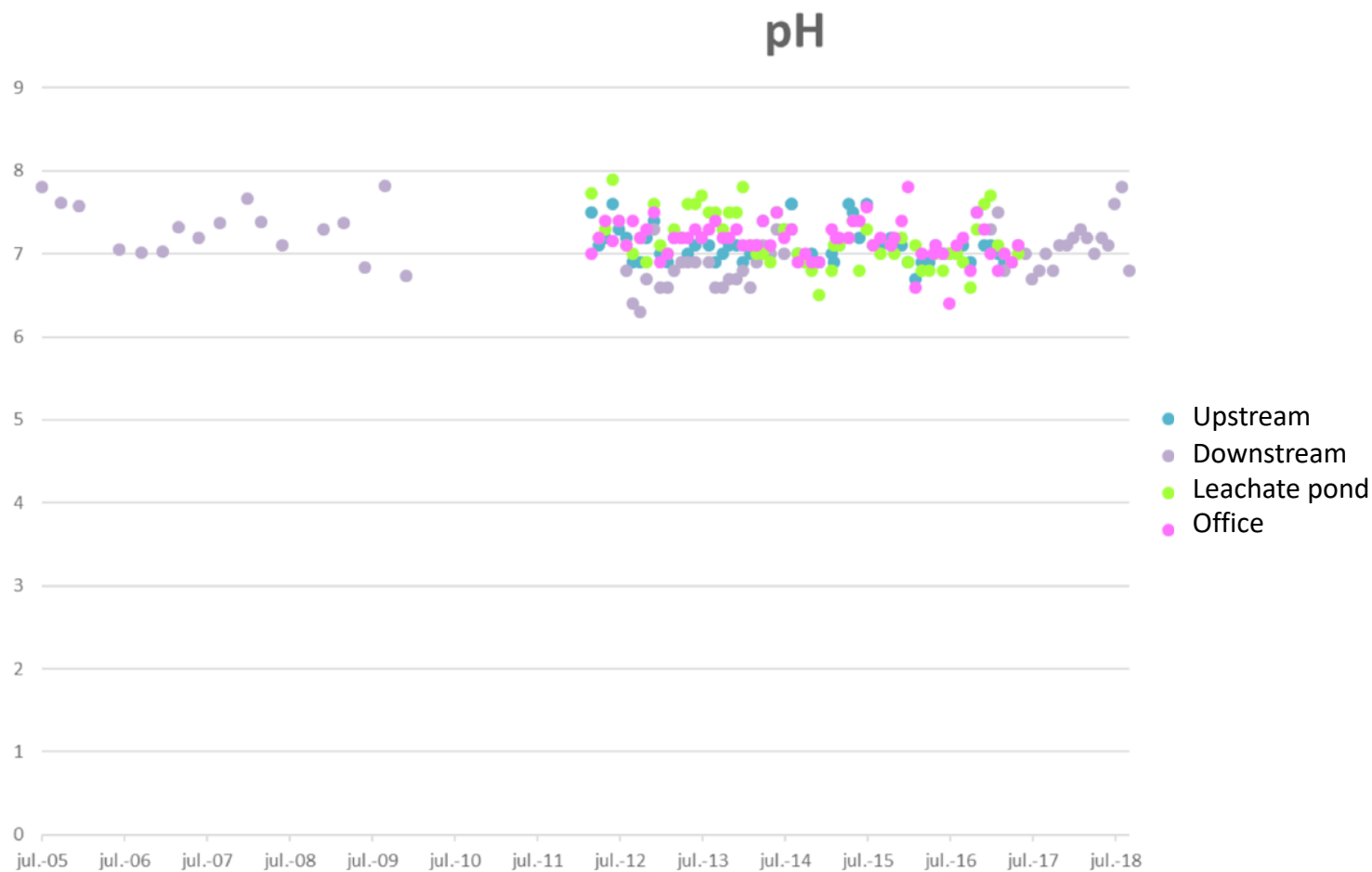


Parameters	
Mineral oil	Total phosphorus
Arsenic	Mercury
Boron	Hydrocarbons
Barium	Molybdenum
Cadmium	Total nitrogen
Chlorides	Nickel
Electric conductivity	Lead
Total organic carbon	pH
Total chrome	Depth of the piezometric level
Chrome VI	Antimony
Copper	Selenium
COD	Suspended solids
Phenols	Sulfates
Fluorides	Zinc

To carry out the data analysis, the results of the analyzes of the various control piezometers have been grouped, jointly considering those corresponding to:

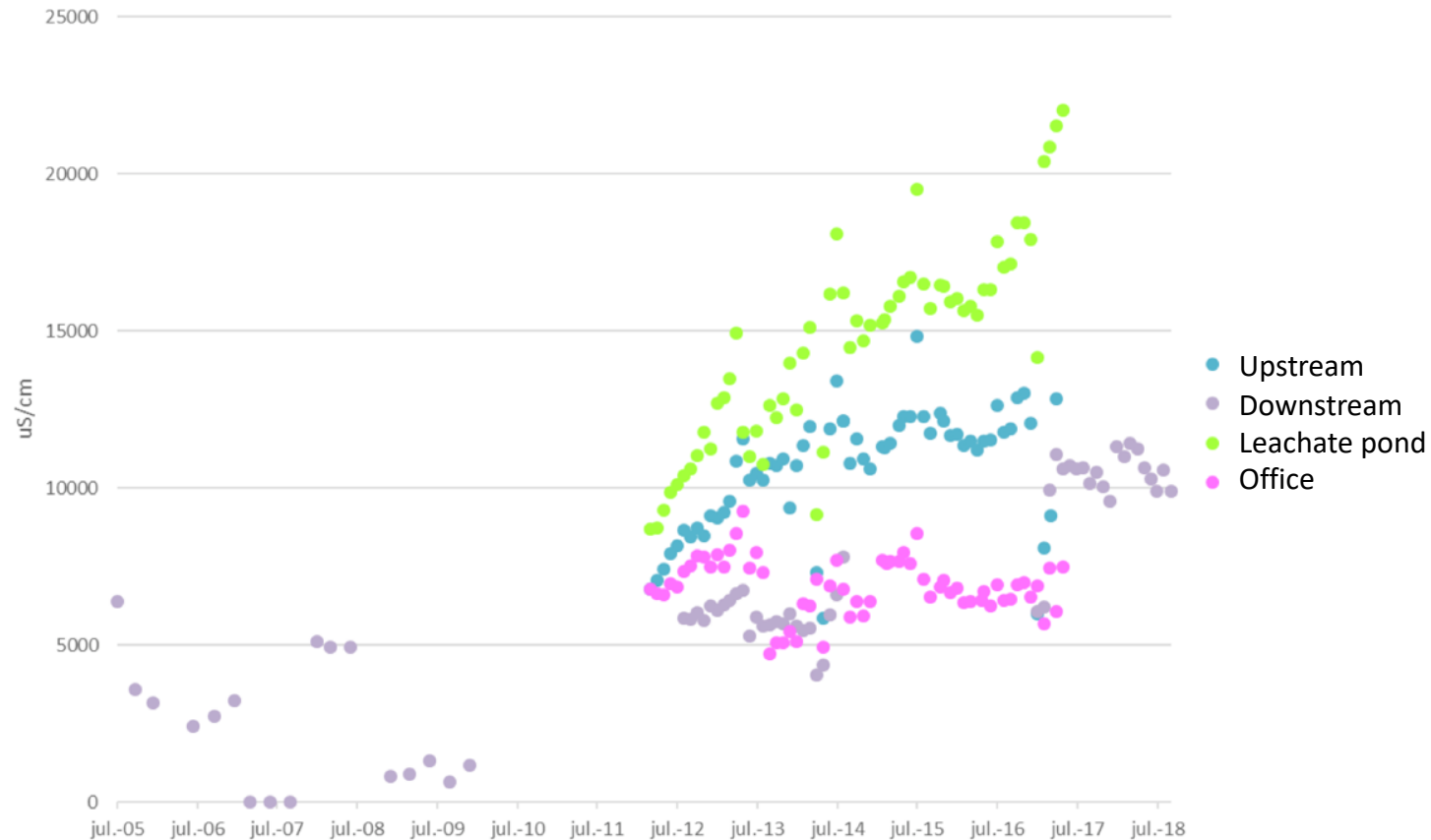
- Upstream piezometers: PVEX1 – PVEX2 – PVEX3
- Downstream piezometers: PVEX4 – PVEX5 – PVEX6 – PVEX7 – PVEX8
- Office piezometer: POF
- Leachate pond piezometers: PB1 – PB2



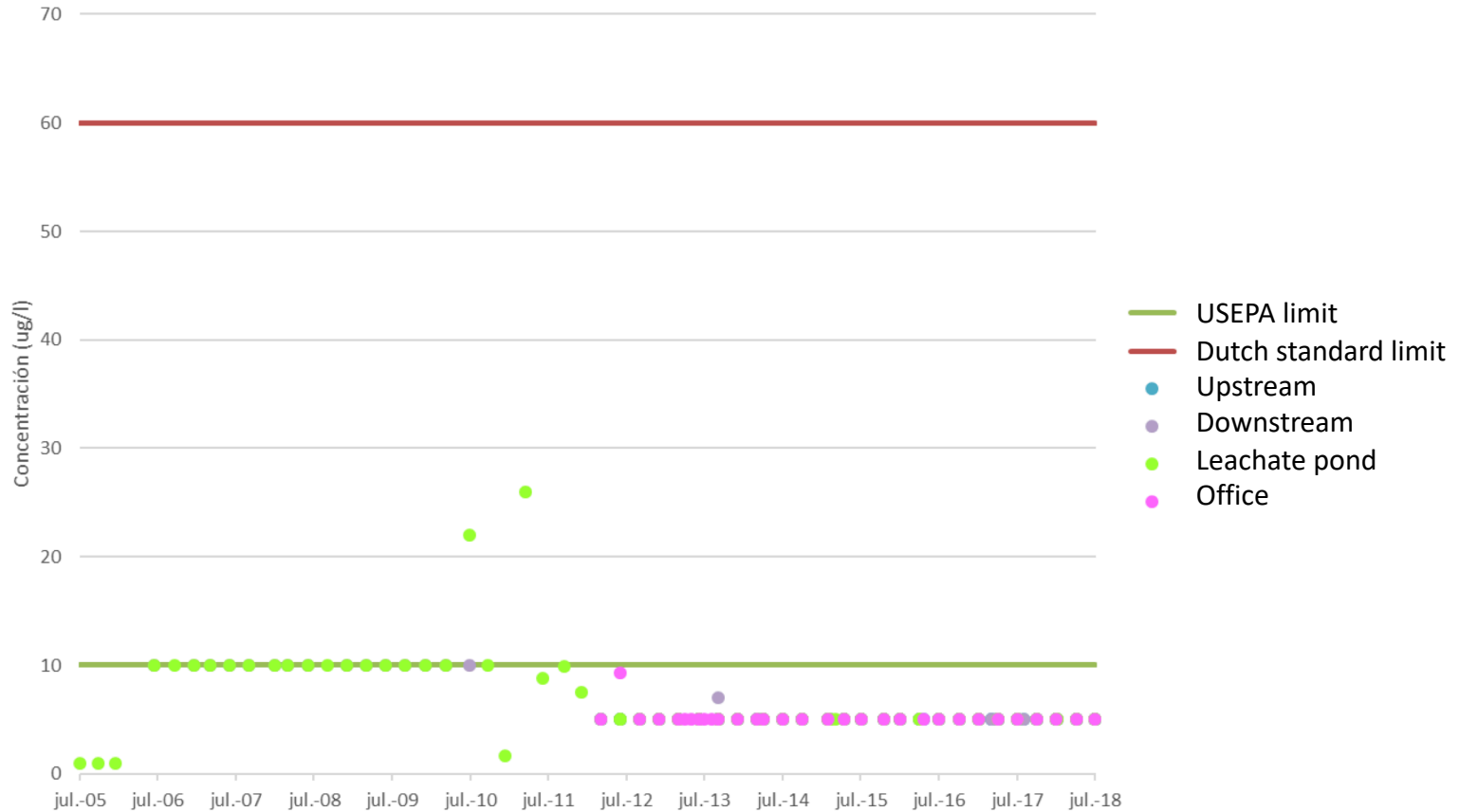




## Electric conductivity



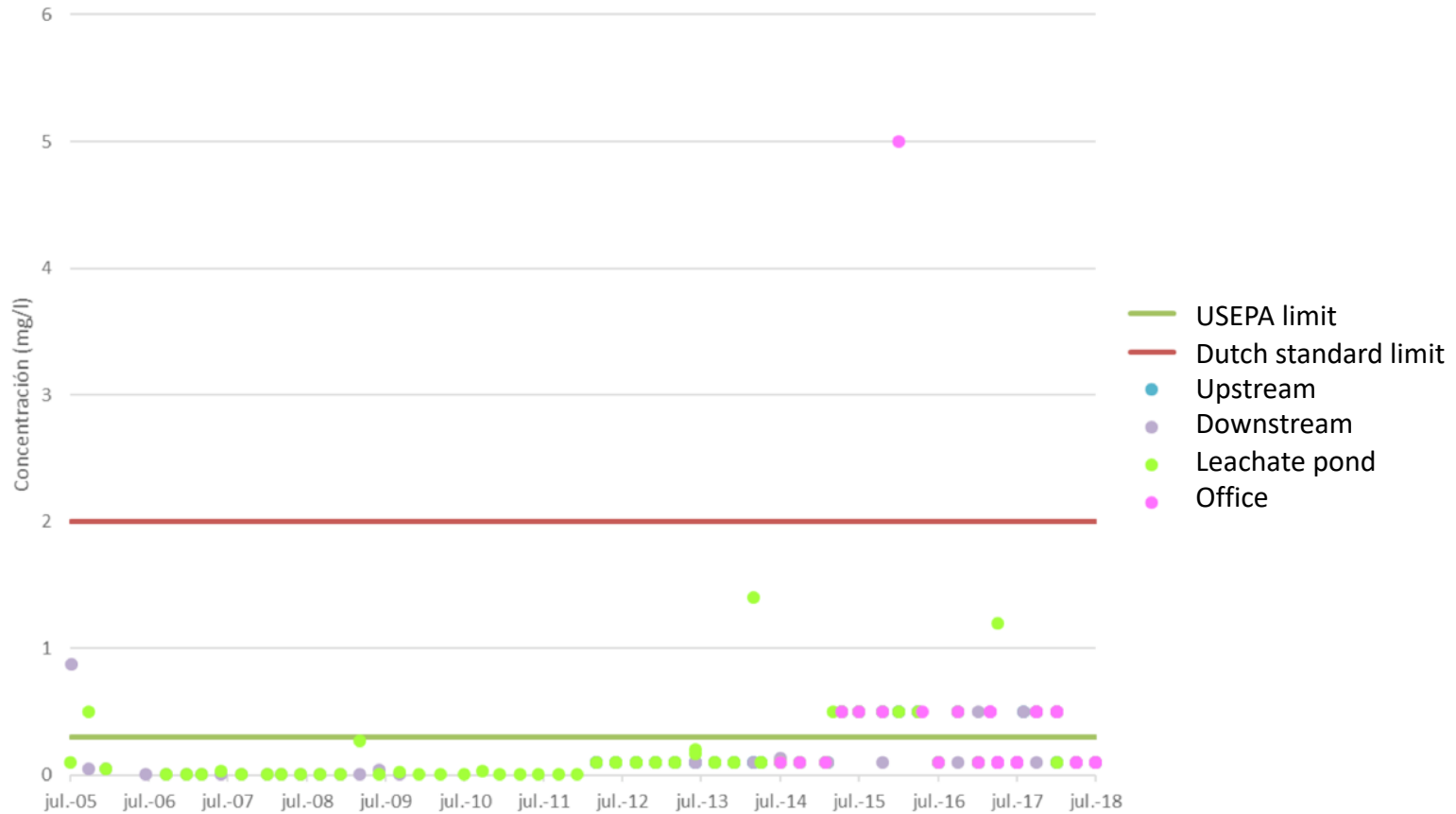
## Arsenic



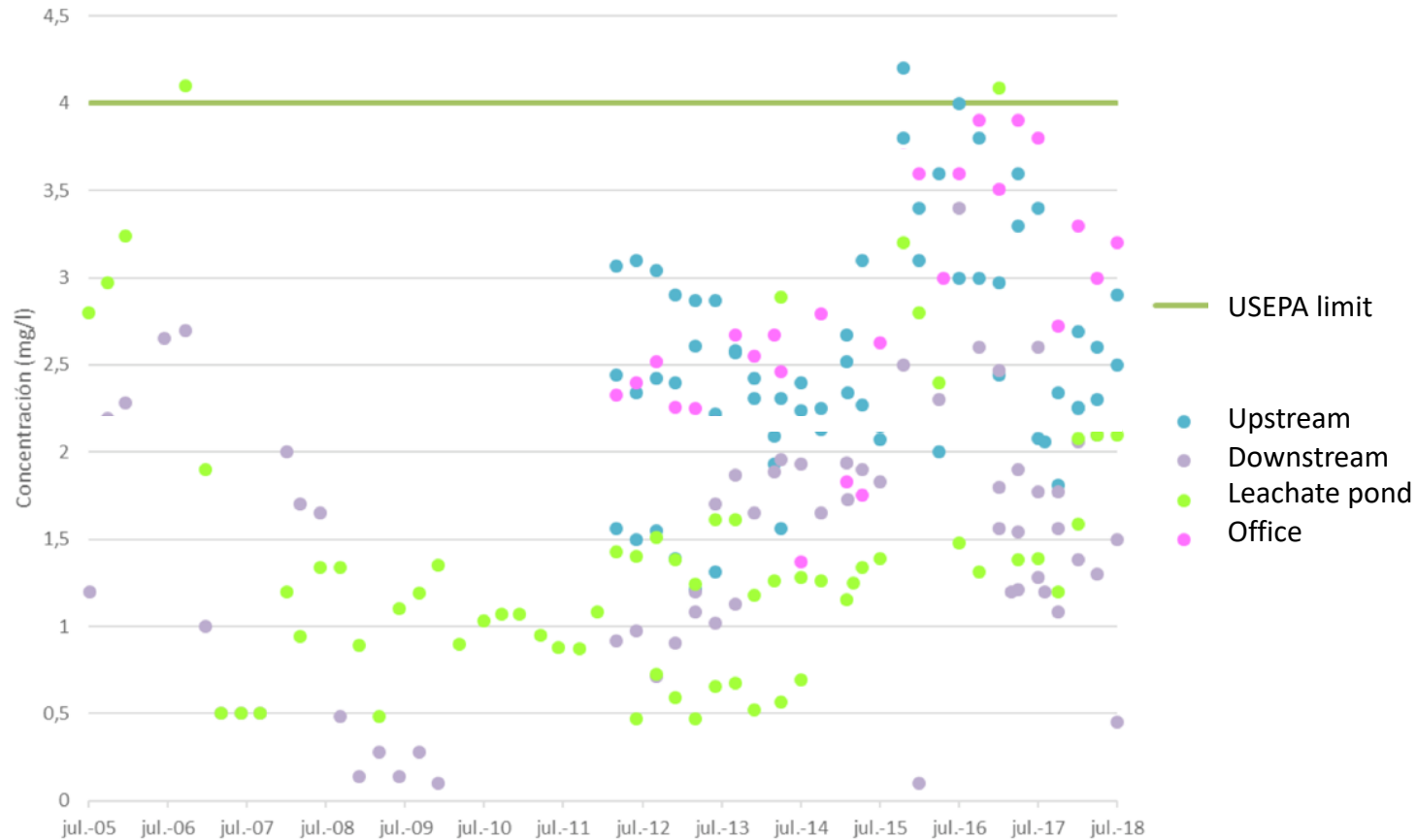
## Total Chrome



## Phenols



## Fluorides

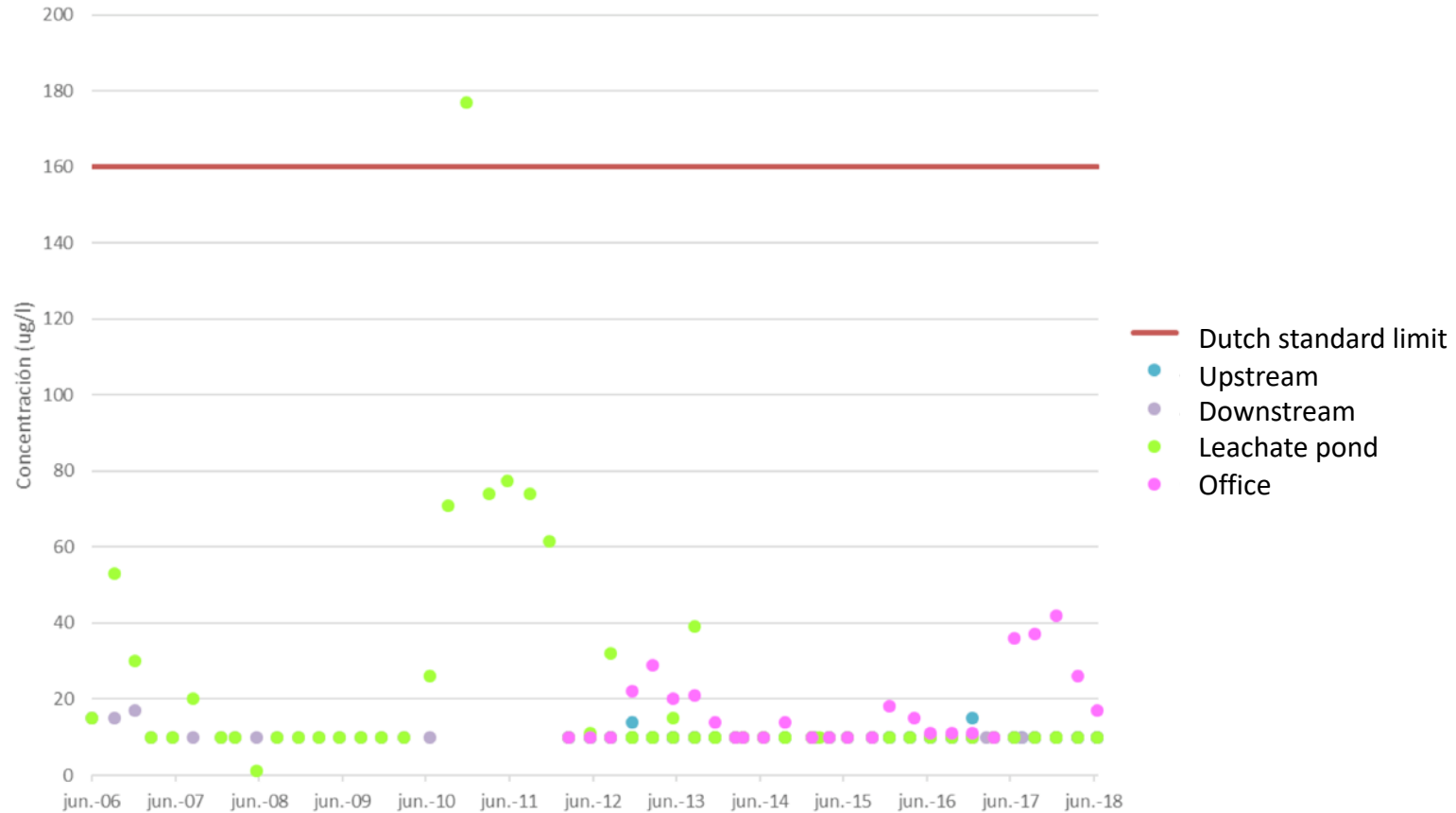




## Molybdenum



## Selenium



- 28 parameters are being monitored on the period 2005-2019
- On every borehole observed concentrations are under USEPA and Dutch legislation standards
- Some abnormally-high values of some parameters (outliers) have eventually been observed. These values correspond to errors on the groundwater laboratory analysis.
- It has been proven that groundwater quality has not been affected by the landfill operations



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