

***Construction-Site School* Urban Water: drawing urban infrastructure by many hands**

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The collaborative extension project "*Construction-Site School* Urban Water at area of water sources" is part of a series of actions inserted in the research project "Stormwater Management in Urban Environment", which aims to develop urban alternatives to incorporate in the urban design itself, compensatory techniques of stormwater management (aimed at local absorption rather than to speed up the flow), particularly in cases of land tenure of slums, seeking for environmental recovery and improvement of public spaces. The main justification of the project is the need to develop alternative urban and environmental recovery and minimize the impact of urban occupation done informally, by self-construction, without urban infrastructure, under physical risk, in areas that are formally environmentally protected by law.

Facing the proposed of work at concrete urban context, the *Construction-Site School* was proposed as a collaborative activity in the Alvarenga settlements, at Sao Bernardo do Campo, at Billings watershed, which have had some previous work of some team members. In the recent project was given sequence to dialogue in the identification of cases to be treated as well as the search for technical solutions, starting from the premise of the involvement of residents and Housing, Urban Planning, Environmental Management and Urban Services Departments, to provide the exchange of knowledge and joint action.

Current studies in Alvarenga aim to develop the use of compensatory techniques that can be applied as a complement to conventional networks, increasing the urban design possibilities and improving effectiveness at minimizing environmental

impact of the occupation over the watercourses and to the environment in general. Such techniques allow attendance in situations where traditional solutions are unable to reconcile environmental restoration and improvement of conditions of social interest housing. It is worth noting that in many circumstances the development conditions of construction work, either by the form of hiring (whose procedures generally rule out the possibility of alternative or innovative designs), management or financing requirements, it leads to absolutely inadequate technical options for the local situation. Hereupon, the current work strategy has been to develop urban designs whose premise puts in favor of conventional techniques association with alternative techniques: improvement of conventional infrastructure, either by isolated construction works or construction works connected to them, always seeking to better performance.

The settlements has significant potential as a pilot project: it is located at area of water sources; has poor urban infrastructure, when it exists; has largely consolidated houses; there are remnants areas and unoccupied areas; the topography is rugged; the implementation of pathways is inadequate; there are nature wetlands and stretches with preserved vegetation. In that framework conditions and having extensive previous knowledge of the area and relationship with the local community, it became clear the potential for collaborative intervention work.

The first activities of the *Construction-Site School* in the Alvarenga took place in 2013 and aimed to develop, in a specific urban context, unconventional solutions to urban drainage in an articulated way to the physical configuration of precarious settlements in order to make recommendations for urban and environmental compliance. The proposals relating to drainage to be made, seek, at the same time, to qualify the urban space and minimize the impacts of occupations. It has also sought to contribute to the formation of its various actors involved in theoretical (rationale and design) and practical aspects (construction work) of production space, considering the specificities of protected areas of water sources. From a repertoire of solutions, such training also aims to contribute to qualified the participation of residents in discussion of future intervention in these areas, thus collaborating with the local government in the implementation of urban designs qualifying.

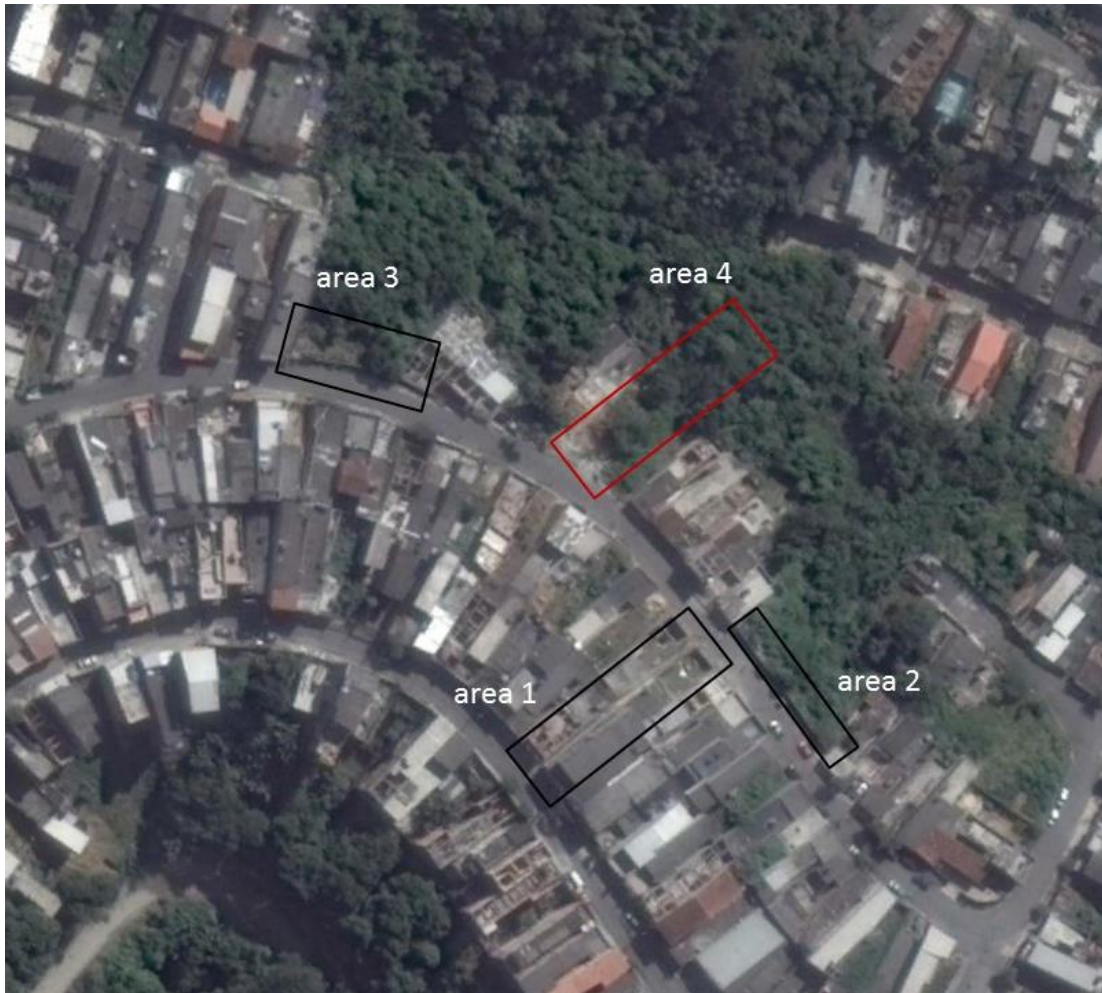
Completed this process, it was the time to mapping specific indications of possible intervention points in the neighborhood, considering its problems and potential.



[Figure.1] Mapping areas of interest in the Alvarenga neighborhood (blue dots) and stream watershed (yellow dotted).

Effectively, the design work began on continuous technical visits to better define the watershed and to choose potential urban designs areas. After identifying the work potential in section 8 (one of the lowest point on the neighborhood, where the stormwater of several streets arrives, and point of recurrent floods), the demarcation of the stream watershed was made (Figure. 1). From this, the street named

Cordilheiras dos Químicos stood out as prime location for implementing intervention model (Figure.2).



[Figure.2] *Cordilheira dos Químicos* Street and the four áreas of urban design.

At the present time, there are four areas defined for urban design in detailing phase to be implemented in joint work between Services and Works Department, students, residents and faculty, in a reciprocal learning process. Here we highlight the area 4, where it is already built a hydraulic ladder with conventional design and execution. This device was built by the city in 2013 with the aim of preventing floods and erosion of the slope. However, since the device was built, without the proper solution for the arrival of the water, its action has brought more harm than gains. By failing to give proper destination for the water that collects, it accelerates the process

of erosion on the edge of the slope and speeds up the arrival of water in the lower parts of the settlement.

The goal of the urban design area 4 is to combine the conventional device already built, understanding its necessity for the stormwater of rains of great flow, with some alternative devices, which purport to address diffuse pollution in lower flow rains. Each alternative device, coupled to the conventional hydraulic ladder, contains a rain garden, with the necessary structure for the filtering of diffuse pollution. The arrival of the hydraulic ladder is going to be done by levels which receiving the stormwater and slower refers to the lowest point, preventing slope erosion.