CLUSTER SYSTEMS: El Corazón de Santa Fe

Cluster systems leverage economies of scale and proximity. A cluster system can use multiple flows and deliver them to a single point. For new construction, a cluster system can be integrated into the planning and building with relative ease. Materials and labor are less for cluster systems because multiple users can access common equipment such as controls and pumps. The storage and distribution can then be amortized over many properties. In this case the system cost around $250,000. This amount was spread among 72 properties, so the individual cost was about $3,500. A small fee allows the owners to collectively hire a maintenance company to care for the system.

This project involves an apartment complex that was to be torn down and replaced with a condo development in the center of Santa Fe. A water strategy and budget were developed to create a project that would use less water than the existing residences. Part of the design involved the active collection of rainwater from the roofs of 72 residences. The harvested water would be stored in two cisterns each with over 50,000 gallons (189 cubic meters).

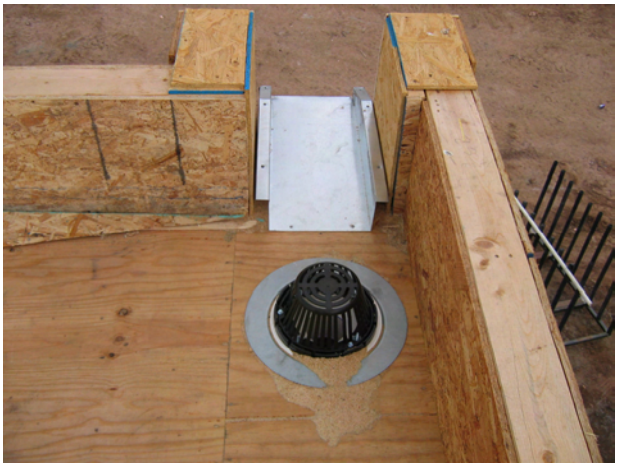
The system harvests from all roofs, uses vertical gravity first flushes at each drop. The most unique element was the storage system. The cisterns are built with 8 foot diameter metal culvert to provide structure. Culvert is easy to install and is rated for heavy traffic. The actual storage of water is within a plastic bladder that is housed in the culvert shell. The systems has several advantages:

1. Lower cost than other storage. The culvert and bladder were landed in 2004 at a cost of $.40 per gallon. There is of course installation, but this is less than other systems as well.
2. The system can be cleaned and repaired. The bladder can be patched and has a 30 year life expectancy even when exposed to UV. There is of course no UV exposure in this case.

The following six pages will show stages and details of construction through completion. The process begins with excavation and ends with the newly installed landscape and finished residences. There are several pages of construction details to show developers, regulators, and others what these systems look like on the ground

EARTHWRIGHTS DESIGNS
Technology and Nature
30 Camino Sudeste Santa Fe, New Mexico 87508 USA
Phone/Fax (1 505) 986-1719 email: ezentrix@aol.com

Cluster Rainwater Harvesting Systems: El Corazón de Santa Fe



Roof Drain: December 2004

First Flush : December 2004

Roof Drop to Conveyance: January 2005

Roof Drops to Conveyance: January 2005

Lateral Conveyance: January 2005

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Auxiliary Water line with dual check valves and electric control valve

Irrigation Pump

Irrigation Line Pressure Gauge and Line Flush Valve

Pressure Sensor

View from serviceway.

Pressure sensor tube and pressure tanks

Cluster Rainwater Harvesting Systems: El Corazón de Santa Fe

Programmable Logic Controller connects the cistern to the irrigation system for completely automatic level reading and control.

Complete system with new landscape: May 2006

The entire cistern infrastructure is located beneath the parking lot. No space above ground was taken away from the development.

This is a small subdivision of 8 houses. on a property of about 1.75 acres. Each home has about 2000 square feet of roof space. The original grading and drainage plan was a typical collect, direct, dispose with almost 9000 cubic feet covering nearly 1/4 acre. The owners wanted a more sustainable solution so a system of passive infiltration and active harvesting was created. The passive component is a series of 9 infiltration galleries to harvest the majority of overland sheet flow. (1) Each galleries is lined with newspaper and much of the cardboard waste that was generated by the construction. Next was a layer of the least

expensive crushed gravel available. (2 & 3) The purpose of the first two layers was to form an anaerobic zone to seal the bottom of the galleries with slime bacteria. Future projects will also include horse manure as food for the organisms. The objective is to move water laterally to root zones rather than percolating to greater depths. On top of the gravel was a layer of pumice to provide the aerobic "sponge " to provide lateral water for tree and shrub roots. (4). The pumice was covered with polypropylene filter fabric. Final grade left shallow depressions where water is seen that has collected from the first rains and is infiltrating into the galleries. (5) In addition each of the enclosed courtyards has a sag that will infiltrate roof runoff that enters that area.

Integrated Water Harvesting in a Small Subdivision: Passive Components

El Camarico Subdivision, Santa Fe, New Mexico Owners: Tom Allen & Oida MacGregor

Collaborative Project w/ Ecoscapes LLC and Dove Excavating

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The conveyance of the harvested roof water was done by three trunk and branch lines. (1) Because of the wide distances, first flush removal was done at each of the downspouts. Sump boxes were used to isolate the first flush and to allow any sediment to drop. (2) The three trunk lines are piped to a 600 gallon cistern which serves as a surge tank. (3) Two effluent pumps of 2 hp each are cycled in the cistern to provide transfer to the mainstorage tanks. (4) In high flow events, both pumps will operate simultaneously. Downspouts were painted to protect the pipe and to blend into the décor of the subdivision. (5)

Integrated Water Harvesting in a Small Subdivision: Conveyance

El Camarico Subdivision, Santa Fe, New Mexico Owners: Tom Allen & Oida MacGregor

Collaborative Project w/ Ecoscapes LLC and Dove Excavating

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1

Storage of the harvested water required large capacity. This system uses 8 foot diameter culverts to provide structure to store the water. (1&2) The total capacity is 20,000 gallons. The actual storage of the water is done in a bladder inside of each culvert. The bladders are wrapped in geotextile fabric for protection. (5) Each bladder is filled and drained from a bottom outlet. (3) An air vent is provided on each bladder. (4) There are level equalization lines between the two units and fill equalization lines at the top. (7) The fill equalizer also acts as the overflow. The bladders can


7

be isolated by the valving for eventual repair. The system was developed for its cost advantage over fiberglass tanks. Besides providing a sustainable water supply for irrigation, the integrated system allowed for the reduction of the required retention ponds. (6)


2


3


4


5


6

Integrated Water Harvesting in a Small Subdivision: Active Components

El Camarico Subdivision, Santa Fe, New Mexico Owners: Tom Allen & Oida MacGregor

Collaborative Project w/ Ecoscapes LLC and Dove Excavating

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30 Camino Sudeste Santa Fe, New Mexico 87508 USA

Phone/Fax (1 505) 986-1719 email: ezentrix@aol.com