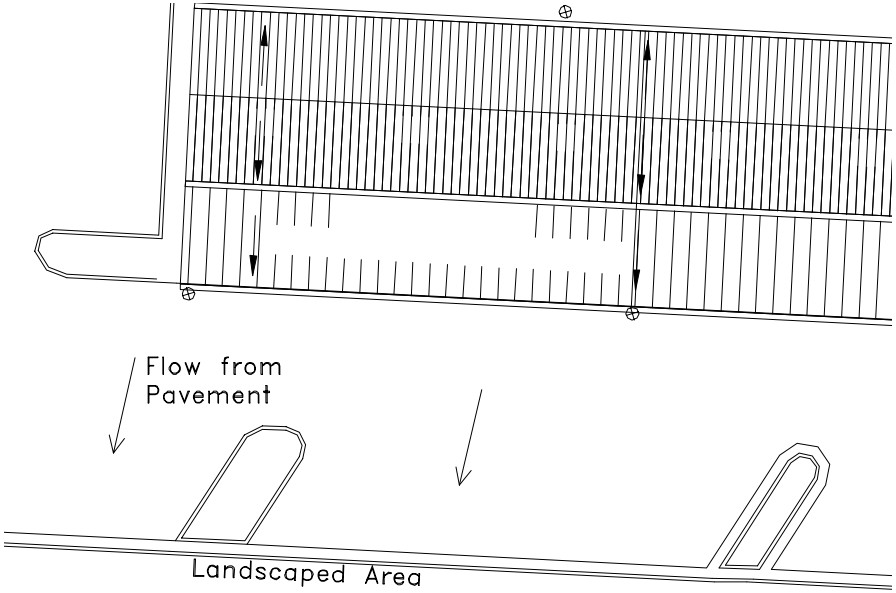
1

2

Passive Water Harvesting uses the sheetflow from impermeable surfaces to concentrate precipitation in an area of living soils and plants. The least expensive place to create storage of water is in the soils, so passive water harvest potential is the first analysis of any project. Passive water harvesting increases the effective rainfall by concentrating precipitation from a broad area into a much smaller one. This is shown in the drawing (#3). This project uses roofwater for active collection to water landscape and flush toilets. The sheetflow from the pavement will be directed through curb cuts (#2) to the landscape. This type of harvesting has increased the effective precipitation from 12 inches to about 36 inches. This allows for less xeric plantings including deciduous shade trees. An example is the apricot tree (#1) that is watered by sheetflow from a gravel driveway



3

PASSIVE WATER HARVESTING PRINCIPLES

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3

This installation shows the use of a system of on contour swales with drought tolerant plantings for water harvesting. The water is provided by downspouts from the home as well as sheet flow from the hillside.

Western soils are generally not absorbent. During our fierce rainstorms the valuable rainwater runs into our storm drainage systems and creates pollution and erosion problems downstream. To turn this problem into a resource, we dug swales on contour to harvest the runoff from this hillside, installed drought tolerant plantings, and mulched with gravel. The owner can water these plants infrequently during dry times by simply putting a hose in the end of each swale and letting it fill. Most of the time, no watering will be necessary.

Over several years this landscape will mature into a large, colorful, and low maintenance front yard.

2

1

Illustrations:

1. Day Lily from swale planting
2. Plants in swale after gravel mulching
3. Open swales
4. Planting in Swales

4

Water Harvesting from Surface Runoff

Private Residence, Santa Fe, New Mexico

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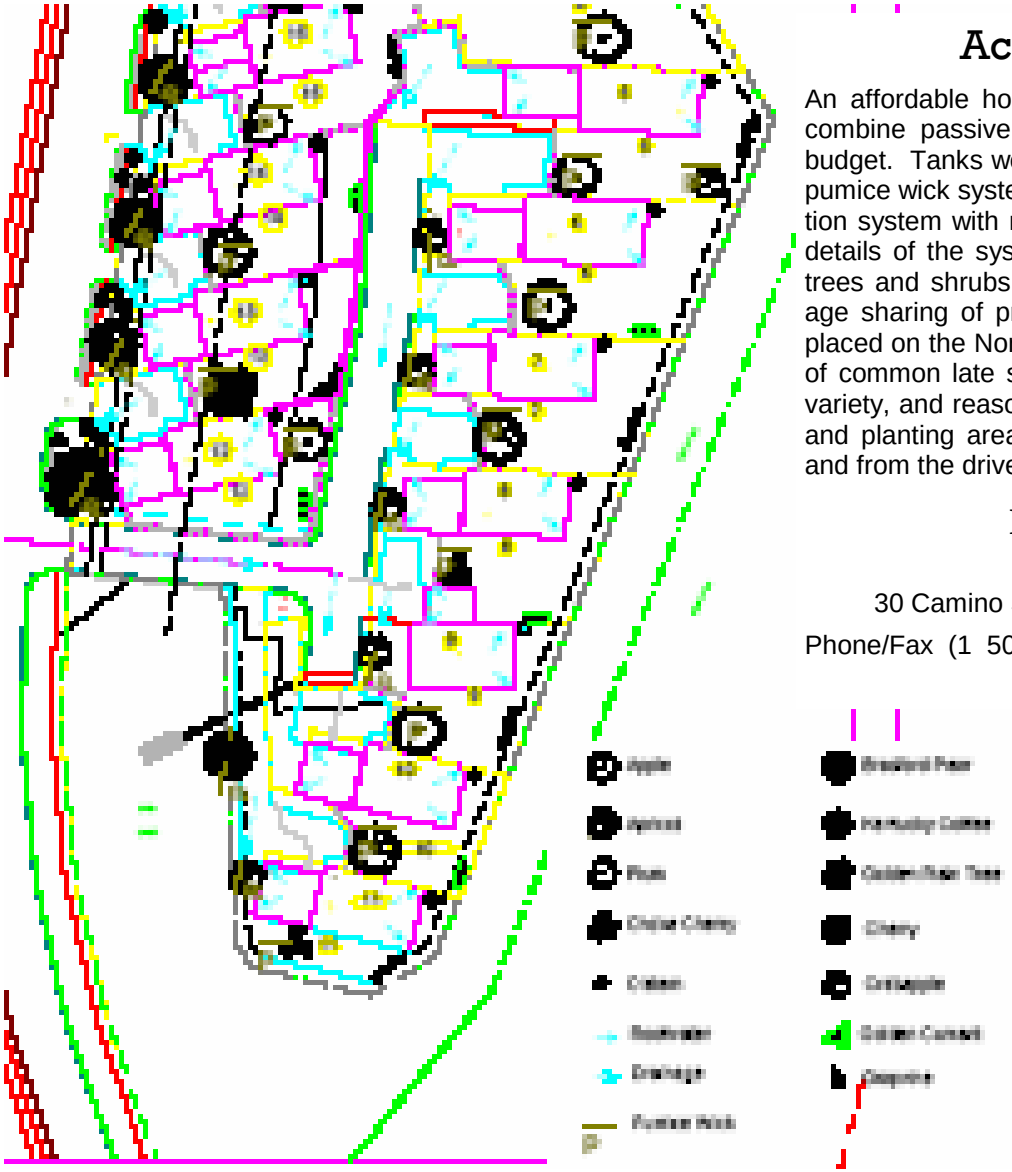

Active/Passive Hybrid System

An affordable housing development in Santa Fe, New Mexico sought to combine passive solar design and rainwater harvesting on a very tight budget. Tanks were purchased in bulk with each tank to be connected to a pumice wick system. The objective was a small water harvesting and irrigation system with no moving parts other than a hand operated valve. The details of the system are shown on the following page. A variety of fruit trees and shrubs were distributed throughout the development to encourage sharing of produce and community interaction. The fruit trees were placed on the North sides of buildings to encourage later flowering because of common late spring freezes. Street trees were chosen for toughness, variety, and reasonably low water consumption. Placement of street trees and planting areas was done to harvest rainwater from the garage roofs and from the driveways

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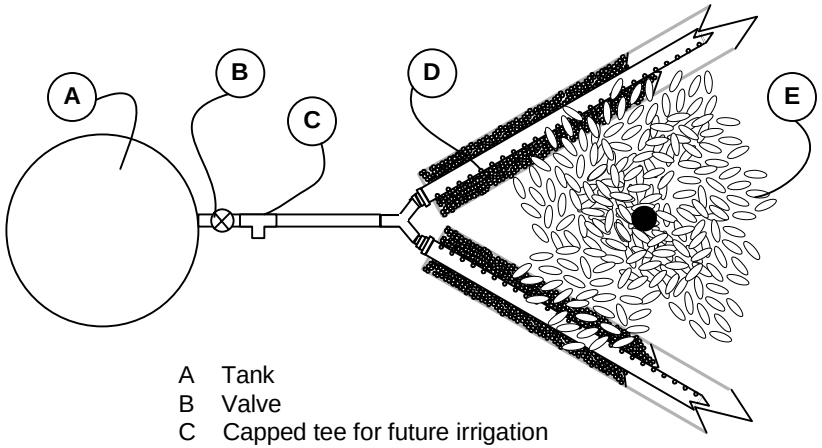
EARTHWRIGHTS DESIGNS

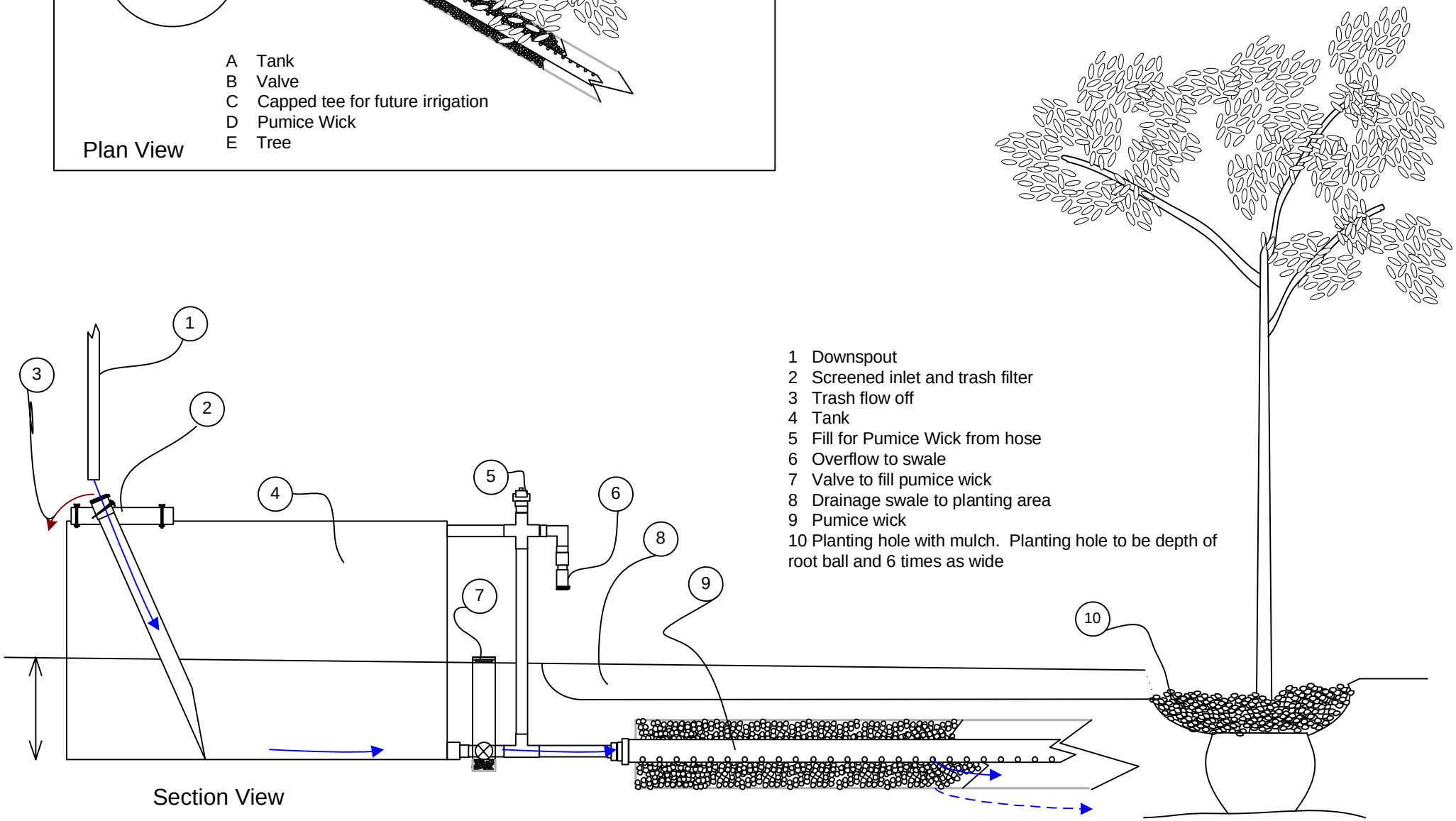
Arroyo Chico: Tank and Pumice Wicks

RAJ 11/18/02 NTS



A Tank
B Valve
C Capped tee for future irrigation
D Pumice Wick
E Tree

Plan View



1 Downspout
2 Screened inlet and trash filter
3 Trash flow off
4 Tank
5 Fill for Pumice Wick from hose
6 Overflow to swale
7 Valve to fill pumice wick
8 Drainage swale to planting area
9 Pumice wick
10 Planting hole with mulch. Planting hole to be depth of root ball and 6 times as wide

Section View

This installation shows the use of a subsurface drainage system for water harvesting. Components that were originally designed to move storm water off of a site can also be use to move that same water around a site to where it can be used. Storm events here are infrequent and convective, and soils are generally not absorbent. This results in potential runoff and erosion with the valuable rainwater lost. This design used the natural contours of the land to direct runoff to the trench line. In this line is a sand filter and a special drainage piping system. This allows water harvesting of overland runoff. This water is filtered and can be sent to a cistern for later use. A dry streambed was laid over the drainage system for protection and aesthetics. Because the revegetation was done in winter, a straw mulch blanket was used to control dust from springtime wind storms, to protect the seed, and to prevent erosion until the summer rains come. This will also provide cleaner water for the catchment system.

Illustrations: clockwise from left:
1. View of the property before work is begun
2. Roll of the drain core
3. Installing drain core with sand filter
4. View of the property after work is complete

Water Harvesting from Surface Runoff

Eldorado, New Mexico

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Subsurface water collection and distribution systems known as “Pumice Wicks” were invented by a local designer, Tom Watson. The pumice wick captures effluent or stormwater water from a channel or pipe, and holds it for 2-6 weeks. Measured capacity is 4.5 gallons of water per cubic foot of wick. (608 liters/ cubic meter). As the ground dries out, the pumice wick releases its water and makes it available to nearby plants. Tom’s systems have also been used for untreated sewage.

Illustrations Counterclockwise From Upper Left

1. Pumice Wick before closing and burying. The wick will be supplied by harvested water from hard-scape runoff.
2. Pumice Wicks in an orchard. Note fill pipe at the arrow. This allows for dosing with other water sources.
3. Cross section of a Pumice Wick showing the perforated pipe at center, the surrounding pumice, and the filter fabric that maintains the shape of the wick and prevents clogging. The dark band around the outside is the soil. Cross section is 1 foot x 1 foot . (.3 meter x .3 meter)
4. Installation of a pumice wick and roof canale catchment system at a residence near Santa Fe.

Pumice Wicks

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Water Harvesting from Hardscape

Private Residence
Santa Fe, New Mexico

This installation shows how a site can be modified to harvest water. The original grade was pitched to drain to the foundation of the building. This was changed to a 2% outward slope. A planter box was built with landscape ties that are made from 100% recycled nontoxic materials. These ties provide structure and they are immune to insects and rot. The flagstone patio was constructed on a compacted base that allows most storm water to sheet off. Between the edge of the patio and the planter box is a trench with draincore that collects and directs the storm water into the pumice wick at the center of the planter box. This way the storm water is harvested and stored in an underground “sponge” that releases it to the plants as the soil dries out. In addition, “watering the garden” requires only that the pumice wick be filled with a hose, so no costly irrigation system was required. A mix of native and drought tolerant plants included perrennials, bunch grasses and evergreens for low maintenance,seasonal color, habitat, and beauty.

Illustrations:

1. Site Panorama during construction which shows open pumice wick
2. Connection detail of drain core to drain pipe in the pumice wick. This is the point connecting collection to distribution.
3. Completed Planter Box and Flagstone patio
4. Site after one year. Note vertical fill pipe to pumice wick on right

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Terraced Retaining Walls

Nambe, New Mexico

Retaining walls stop runoff, prevent erosion, and provide areas for storm water to infiltrate. This installation is just above the Nambe River and along side a driveway. Structural strength was needed to support the drive and terraces. A non-toxic material was required to protect surface and ground water. The Product selected was the “Impact Post” It is made of 100% recycled materials and carries a 75 year manufacture's warranty.

Revegetation of Slope with no Irrigation

This installation shows a revegetation project on a three-to-one slope in the foothills of the Sangre de Cristo Mountains. The area was seeded in May with a buffalo and blue grama grass mixture, as well as wildflower seed. The seed was covered with a soil amendment combining composted manure and composted tree bark. On top of that went barley straw mulch, and the entire hillside was stabilized with a geo-jute net, which acts as a retainer for both soil and water. The net will eventually decompose into compost. Tests at a soil erosion laboratory have shown this system to be one of the most effective. The photo at the right was taken three months after the project was begun. Photos below show the coverage in the second growing season.

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STRAWDAMS FOR EROSION CONTROL : Various Sites, New Mexico

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Straw dams are an inexpensive tool for erosion control where flows are not intense. The bales also absorb water and release it after the flow has passed. Eventually, the bales will rot. Tee posts are used to anchor the bales instead of rebar. In some locations the rebar would be left sticking up, possibly becoming safety and liability issues. T-Posts offer safety and potential reuse. The T-Posts will also allow a second course of bales to be added when the original course silts up.

The dams at upper left show the amount of sediment collected after just four months. This site is ready for native plants, which will use the runoff water and stabilize the soil. The upper right shows an installation to protect a satellite dish. The installers are digging a shallow trench to key in the bales. All disturbed soil is put upslope pf the dams. The lower left shows an installation in a newly formed gully. Note center spillway common to all check dams. The lower right is a newly installed dam system.

CHECKDAMS FOR EROSION CONTROL

Various Sites, New Mexico

EARTHWRIGHTS DESIGNS

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Erosion control is most often the management of the energy in moving water. Check dams are an effective tool for that management. They can be constructed of many types of materials including :

1. Impact posts and other recycled plastic construction materials
2. Non-toxic construction leftovers and rubble
3. Cobble and other materials imported to a site. These dams actually were built with rubble and dressed with the more expensive cobble for aesthetics

The basic concepts of check dams are shown below

1. Spacing for sediment fill
2. Size and material appropriate to flow
3. Keyed into banks and channel
4. Spillway at center away from the banks
5. Apron below the dam with hard surface appropriate to the level of flow