RICERCHE PRELIMINARI

wastewater treatment & constructed wetlands

Basic treatment of sewage includes three stages, known as Primary, Secondary, and Tertiary Treatment.

Primary treatment involves separating out sludge and sediments from liquid. Generally, this process removes only 1/3 of the biological oxygen demand (BOD) from the effluent.

Secondary treatment involves aeration/oxidation of the effluent and contact between the water and aerobic microorganisms. After secondary treatment, approximately 90% of the BOD is removed. Conventional wastewater treatment plants then send the effluent through a stage of chlorination a and return it to local surface water. Using this treatment sequence, BOD is lowered, but nitrogen and phosphorus still remain. These inorganic nutrients can lead to algal blooms in surface water. To address this problem, some wastewater treatment plants direct secondary effluent into as tertiary treatment systems.

Tertiary treatment systems are also known as “advanced treatment” or “polishing.”

Constructed wetlands have become popular for accomplishing tertiary treatment. The anoxic soil conditions associated with wetland plants allow for nitrogen and phosphorus to be bio-chemically transformed and removed from the water.

Wetlands are landscapes where land and water meet. Natural wetlands are amongst the most biologically diverse ecosystems on the planet. The combination of vegetation and soils in wetland systems make them well-suited for trapping and filtering water-borne pollutants.

Numerous precedents exist for constructed wetlands that successfully remove contaminants and decrease BOD, based on the same processes that occur in natural wetlands. In addition to wastewater treatment wetlands, some constructed wetland systems target pollutants in stormwater runoff (heavy metals, nutrients, and suspended solids).

Water depths in wetlands can fluctuate from 0-100 cm of standing water, depending on the season. The plants selected for constructed wetlands should be tolerant of fluctuating water levels and to adapted to the local climate.

possible locations for new sewage treatment plant

visit to existing sewage treatment plant

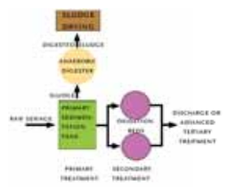


diagram of basic process

advanced treatment

n. river wastewater treatment plant, ny

exeter wastewater treatment plant, uk

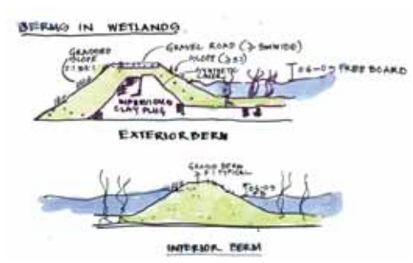
primary treatment

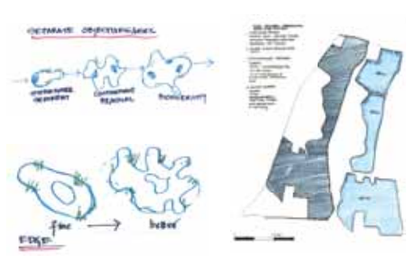
secondary treatment

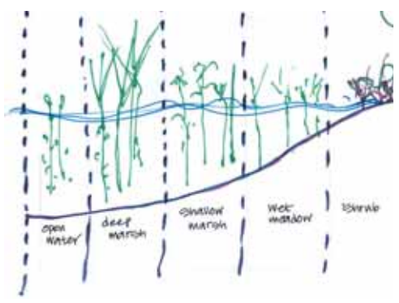
secondary treatment

mechanical tertiary treatment

west point wastewater treatment plant, seattle, wa







raw waste water → primary treatment → primary effluent → constructed wetlands or secondary treatment → secondary effluent → disinfection or tertiary treatment → final discharge

lake construction

When creating a lake, its intended use should guide its design -- including depth, slopes, character of shoreline, and water quality.

The lake bed must be impermeable in order to maintain the desired water level; this can be achieved with a lining of either dense clay or an impermeable membrane. This is an especially important construction consideration for us, because much of the soil in the Parco Roncajette is contaminated, particularly the sediments in the river channel.

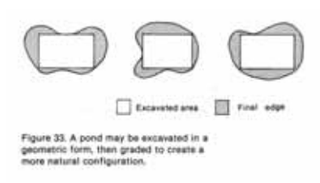
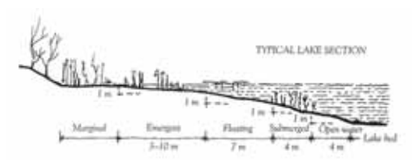


Figure 33. A pond may be excavated in a geometric form, then graded to create a more natural configuration.



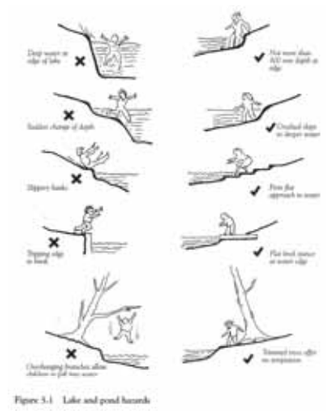


Figure 5-1 Lake and pond hazards

Figure 827-3. Stone pond edge at membrane liner. Stone edge appropriate here with no plastic mat cushion to protect liner membrane.

Figure 827-5. Polymer-membrane pond edge. Turn back liner at top edge, and line earth above to protect against wave action erosion.

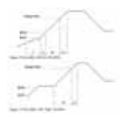
lake edge and type examples

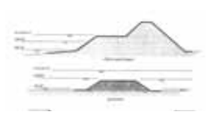
levees & berms

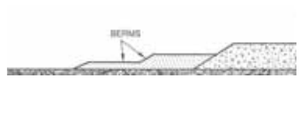
Levees are an important part of the flood control program within and around Padova. These landforms enable water to flow through the landscape at an elevation below sea level, containing the flood water from adjacent land. It is estimated that the maximum flood water storage capacity of the portion of the Roncajette Canal that lies within the core park area is approximately 740,000 cubic meters.

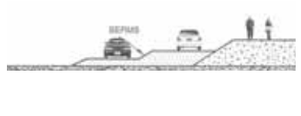
Berms are added to the levees for stability and as counterweight. They can be used for roads. Berms also have added value of being available for recreational spaces, such as bicycle paths and sports fields.

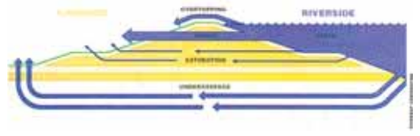
precedent: sonoma park - peter walker & partners

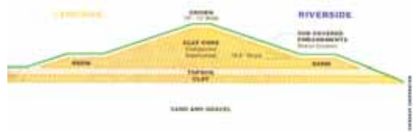








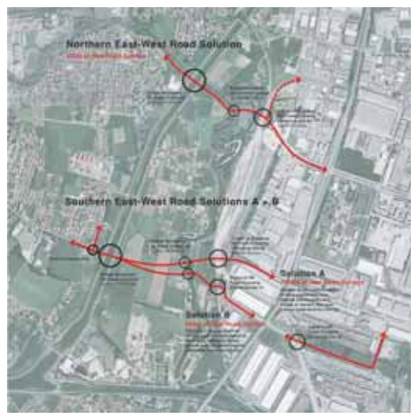


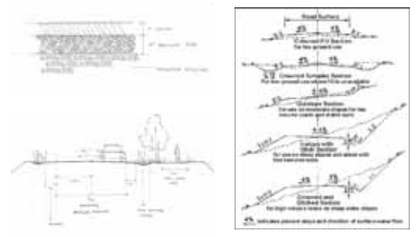


roads, tunnels & bridges

This research includes an analysis of potential new roads and key access points to and within Roncajette park. Possible ways to help automobile traffic cross the railroad include at-grade crossings, bridges and tunnels. At-grade crossings are potentially hazardous. Though tunnels and bridges may be more expensive than at-grade crossings, they offer valuable safety benefits.

Generally, tunnels require less maintenance than bridges and overpasses. Another advantage of building tunnels versus overpasses is that tunnels require less land. Grade-separated crossings need high vertical clearances for the vehicle bridges and long, steep ramps up to the overpasses. Building tunnels conserves land that would otherwise be used for the ramps.





tunnel precedents

footbridge - ronda de dalt, barcelona

la barqueta bridge, seville

transit station research

Good public transportation is a crucial element of regional planning. By offering a variety of ways to move through and around a city, reliance on automobiles for transportation is decreased.

The key components of a transit station are accessibility, mobility and safety. There are numerous design and aesthetic choices that can influence both the transportation functions and public perception of a station. Precedent examples are shown in the images at left.

Sufficient natural lighting makes for a pleasant and safe experience. Clear signage and convenient access to adjacent commercial development are also important.

Transit stations may be built above, below, or adjacent to transportation main lines. Transit hubs that service multiple modes of transportation-- such as bus, tram and train lines-- are more likely to be successful.

railway station lillestrom, norway

railway station st. denis, france

stazioni del tgv model

transit station - vancouver, canada

planting palette

These images show some of the types of vegetation we imagine for Padova. Many of these species will appear in our suggested alternatives for Roncajette Park and ZIP.

The vegetation is categorized according to the uses where they are most appropriate.

jovibarba hirta

sedum ‘bertram anderson’

sedum lidakense

golden kamtschaticum

sedum kamtschaticum

sedum sichotense

green roof plants

typha

nymphaea

eichhornia

phragmites

wetland plants

alfalfa

salix alba

wild mustard

fraxinus angustifolia

schizanthus

populus nigra

phytoremediation

riparian

acer campestre

salix alba

liquidambar styraciflua

carpinus betulus ‘fastigiata’

ficus ingens

populus nigra

populus nigra

platanus x acerifolia

street trees

PADOVA E IL PAESAGGIO: Scenari Futuri per il Parco Roncajette e la Zona Industriale

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