

Design Project 1

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What We Will Cover

- Task/Problem
- Customer Needs & House Specifications
- Design Details
 - Community layout
 - Floor-plan
 - Structure and HVAC
 - Water and Wastewater
 - Energy

The Task



http://www.archdaily.com/294241/the-good-house-crone-partners/50a51f9ab3fc4b263f00012f_the-good-house-crone-partners_good_house_image_01-jpg/



<http://www.in.nrcs.usda.gov/programs/FRPP/FRPPhome page.html>

Customer Needs

- Affordable
- Sustainable
- Aesthetically Pleasing
- Provide basic needs (Amenities)

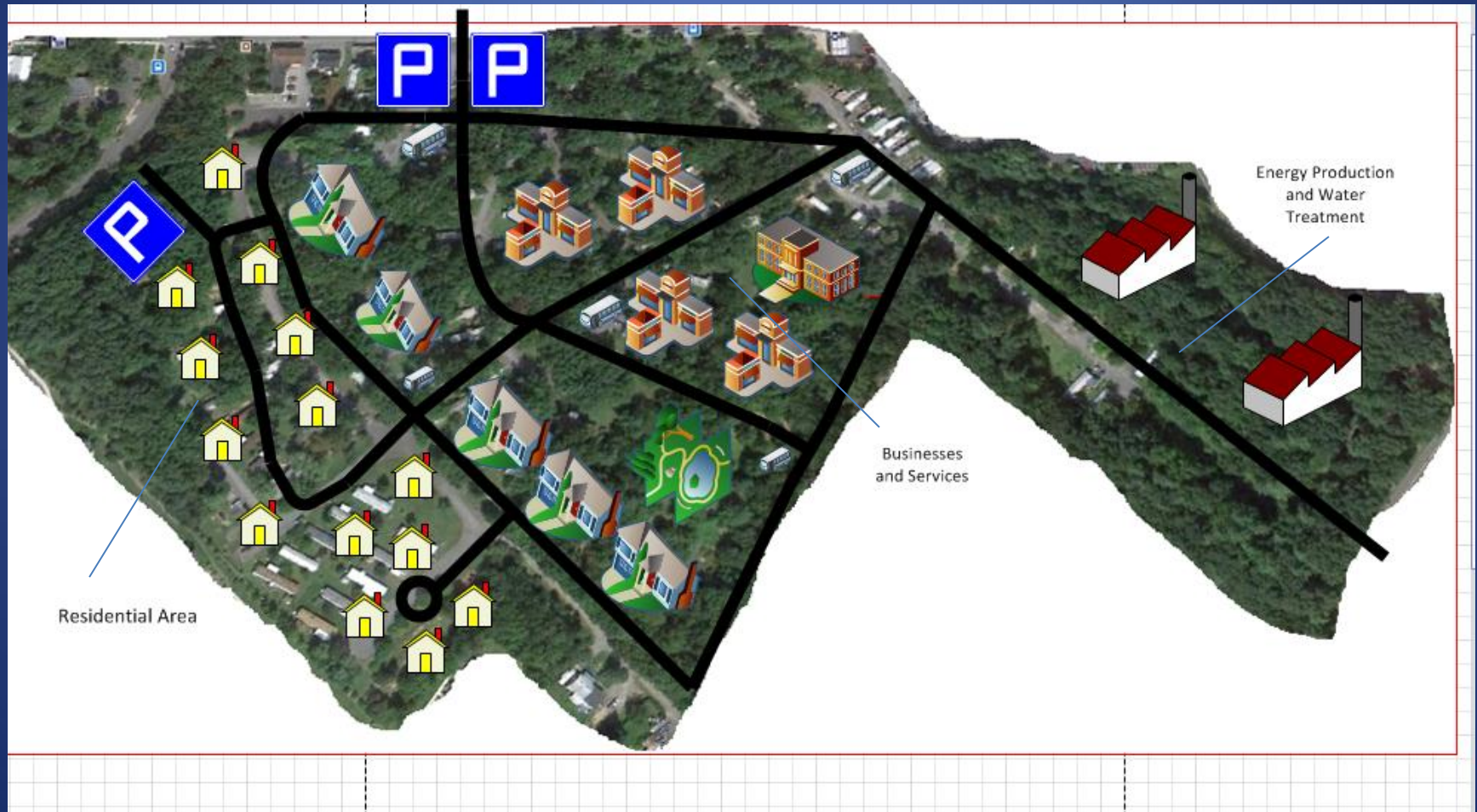


<http://www.familycourtservices.org/>

Home Specifications

- Support a family of 4
- Affordable (\$100,000-\$200,000)
- Energy Efficient
- Easily Accessible
- Walking distance from locations within community (25 minutes)
- Stable/Sturdy

Community Layout



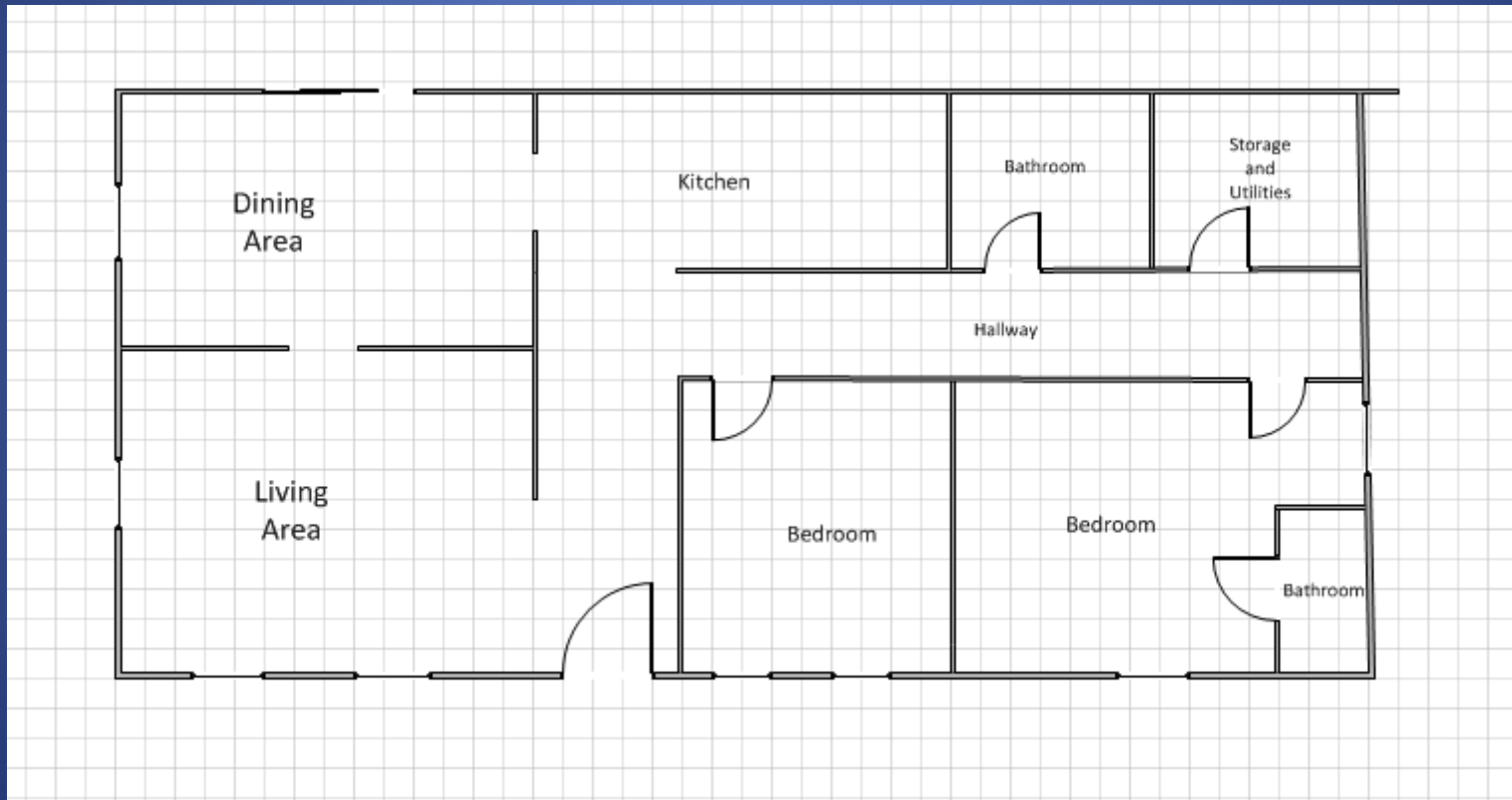
Transportation

- Parking Available at all entrances
- Community bus systems cuts down on traffic throughout
- All services are within reasonable walk/bike distances
- Plenty of roads for such



http://en.wikipedia.org/wiki/File:Go_North_East_bus_5327_Mercedes_Benz_O530_Citaro_NK58_DWE_Red_Arrows_livery_in_Gateshead_5_May_2009.JPG

Floor plan

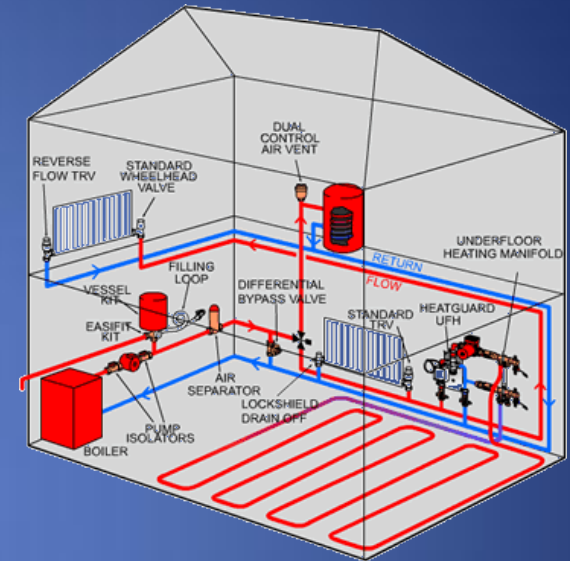


HVAC Overview

- Structure/Insulation And Heating



<http://www.theepochtimes.com/n2/business/insulating-your-home-the-informed-way-312252.html>



<http://www.excellenceinplumbing.com/CompleteSystems.html>



http://ditsonconstruction.com/vinyl_siding

HVAC Options

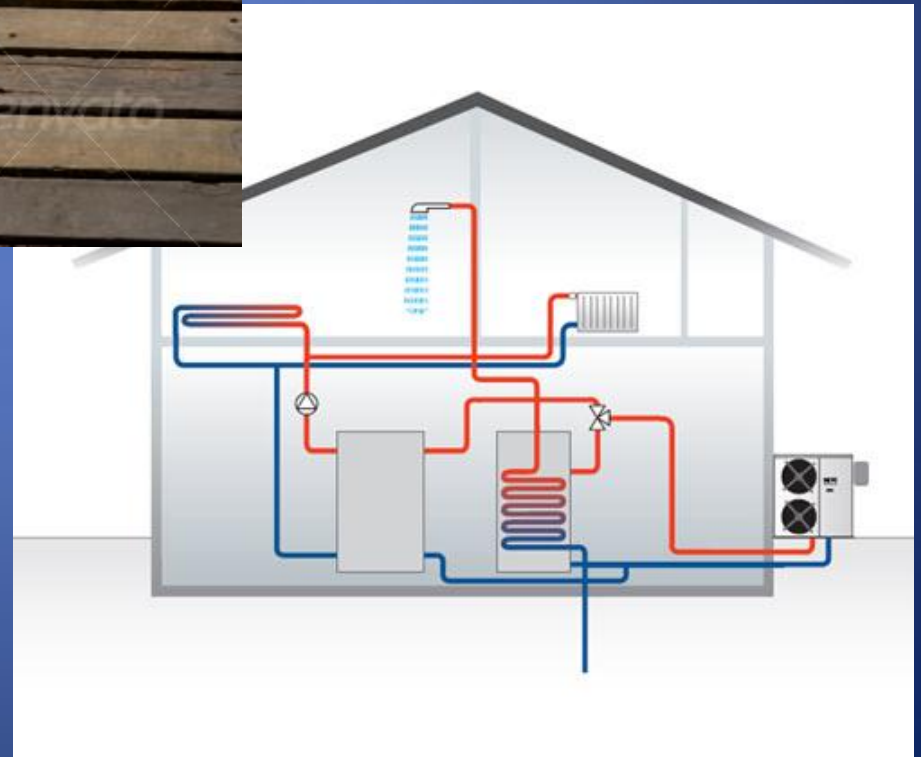


Insulation

- Fiberglass insulation
- Wood
- Concrete
- Brick (and other masonry)

Heating

- Dual Source Heat Pump
- Geothermal Heat Pump
- Air- Source Heat Pump



Fiberglass insulation offers quality insulation with low cost


Main Criteria

1. Insulation should have a high R-value (or Low U factor)
2. Should be low cost

Costs about \$22 for 1 roll

SPECIFICATIONS

Assembled Depth (in.)	470.4 in	Assembled Height (in.)	6.25 in
Assembled Width (in.)	15 in	Coverage Area (sq. ft.)	48.958 ft ²
Energy Star Compliant	Yes	Formaldehyde Free	Yes
Insulation Type	Fiberglass	Product Length (ft.)	39.2 ft
Product Thickness (in.)	6.25 in	Product Weight (lb.)	15
R Value	19	Roll or Batt	Roll
Vapor Retardent	Yes	Warranty Information	N/A

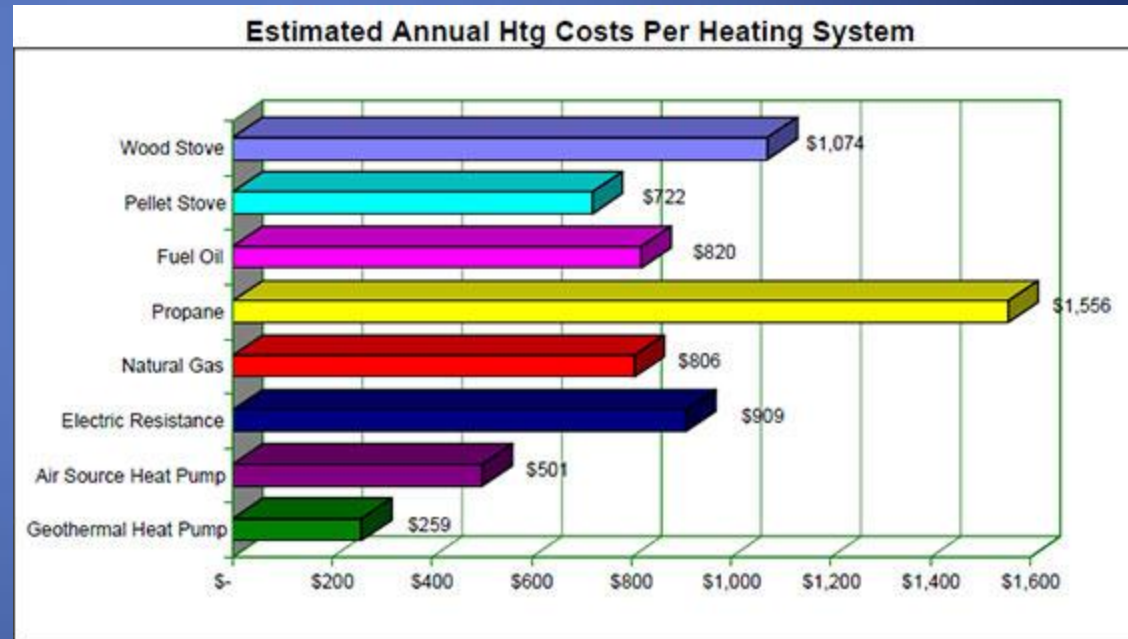
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A dual source heat pump offer me efficient heating than an air-source for less cost than geothermal

Criteria

1. Should heat and cool in one system
2. Should have high efficiency
3. Should have little to no emissions
4. Should have a low installation cost

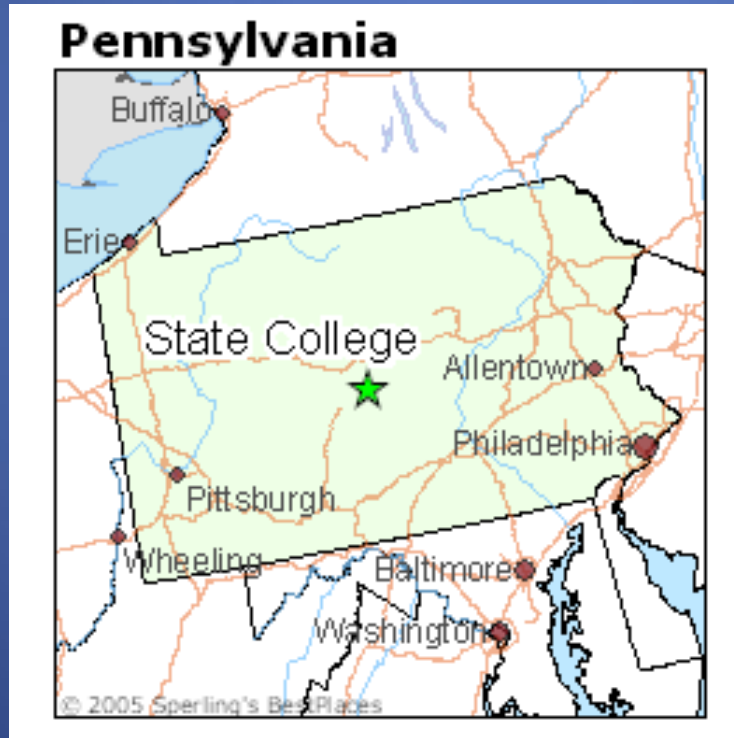
Heating unit would have to be able to heat at at least 30061.2 Btu/h



<http://www.midstateelectric.coop/product-and-services/residential/conservation-rebates/heat-pumps/>

Water Overview

- Specific to our location



Water Source

Surface or groundwater?



Criteria

- Cost
 - Should consider transportation costs
- Efficiency
 - Can supply water for 1000 people at max
- Safety
 - pH of water should not exceed 7.5

Carbon Filtration

Filters out organic compounds and man-made chemicals



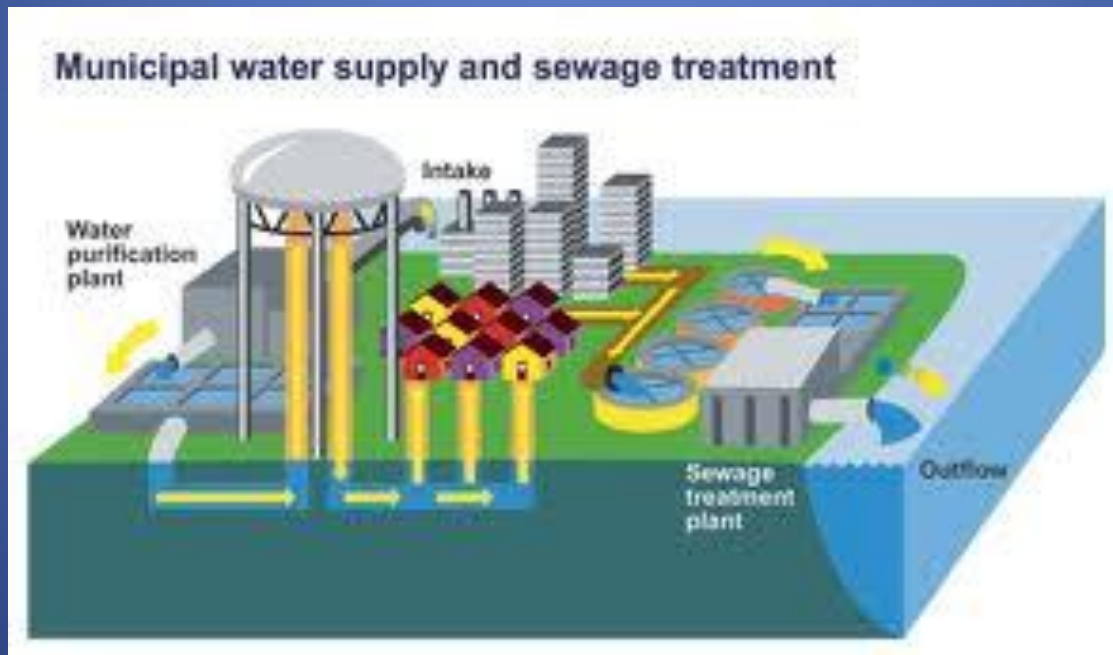
Wastewater Treatment Overview

- Since we are independent for our water supply, gives us incentive to be independent for wastewater treatment



Integration or Independence

Municipal vs alternatives (wastewater)



Criteria

- Cost
 - Low cost
- Efficiency
 - Can handle 1000 people at max
- Size/aesthetics
 - No larger than 2 acres
- Safety
 - pH of water should not exceed 7.5

Imhoff tank into alternating fields



Energy Overview



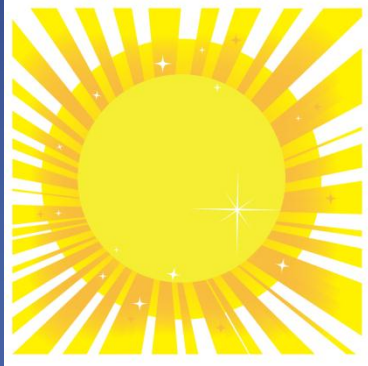
http://en.wikipedia.org/wiki/File:Altamont_Wind_Turbines_7-11-09.JPG



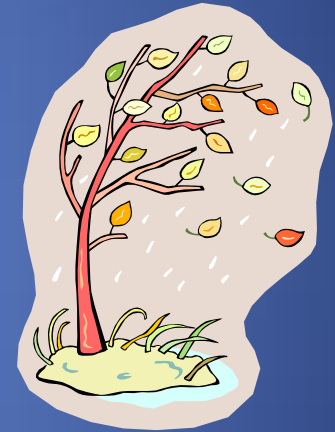
<http://www.mrsolar.com/>

Energy Options

Solar



Wind



Combination of
Solar and Wind



Fuel-Burning Sources

Energy Selection

Criteria

1. Must be able to supply energy demand of the community (around 772.1 kWh per house)
2. Should little to no emissions or waste
3. Source be renewable or have no clear limit
4. Should be cost efficient
5. Should be able to be producing energy at most times



http://en.wikipedia.org/wiki/File:Altamont_Wind_Turbines_7-11-09.JPG

Summary

- Community design promotes alternate forms of transportation
- 1 floor homes to fit 4 people
- Fiberglass insulation
- Dual source heat pump for efficient heating and less cost
- Community based wastewater treatment
- Wind powered energy

- Building Material U-factors from...
<http://www.combustionresearch.com/Infra-Spec/infra-spec/uvalue.html>
- Geothermal HVAC systems information...
<http://energy.gov/energysaver/articles/geothermal-heat-pumps>
- Wind turbine data
<http://www.wind-watch.org/faq-output.php>
- Solar panel information
<http://store.sundancesolar.com/solar101.html>
- Calculator to calculate home energy usage
<http://www.csgnetwork.com/elecenergycalcs.html>
- Information on Carbon Filtration, and other water filtration methods can be found at...
<http://www.freedrinkingwater.com/water-education/quality-water-filtration-method-page2.htm>
- Brief description of Imhoff Tanks can be found at
<http://www.wwoa.org/history/process.php>

Questions?