# Draft Report

## Drinking Water, Sewer, and Stormwater Infrastructure

### Government, Infrastructure, and Public Services Working Group

By: Peter Henderson

Special Board

Comprehensive Plan/Local Waterfront Revitalization Plan

Village of Cold Spring

4/14/2008

(The Village of Cold Spring has received N.Y. State Hudson River Valley Greenway and N.Y. Department of State grants.)

# Contents

# Village of Cold Spring Water Supply

The village owns 22 acres comprising the upper and middle reservoirs off Lake Surprise Road and Foundry Pond Road in Philipstown, plus another 10 acres comprising the lower reservoir and the water treatment facility off Fishkill Road. Water flows from the middle reservoir to the lower reservoir through Foundry Brook, which runs roughly parallel to Lake Surprise Road and Fishkill Road. The total capacity of the upper and middle reservoirs is approximately 15 million gallons. The capacity of the lower reservoir is approximately 1.5 million gallons.[1]


Upper and Middle Reservoirs (Foundry Pond Rd running SW to NE) (Google Earth 10/2007)


Lower Reservoir and Water Treatment Facility (Fishkill Rd running N to S) (Google Earth 10/2007)

## Damming of the Reservoirs

The middle and upper reservoirs are separated by a dam that was constructed in the 1890s. The middle reservoir is also held back by a dam built ???. The DEC inspects the dams every one or two years. Typically the only issues are cosmetic cracks that require patching before they become enlarged and create bigger problems.[2]

Upper reservoir and Scofield Ridge (10/2007)

Middle reservoir and dam (10/2007)

Flow between the upper and middle reservoirs is through a pipe with a manual control valve. Flow out from the middle reservoir into the Foundry Brook is also controlled manually. [NEED TO INSERT NOTE ON CONDITION OF VALVES.]

Upon reaching the lower reservoir on Fishkill Road, Foundry Brook flows into a cofferdam where sediment drops out, and is then fed to the lower reservoir. The lower dam was built ???. Water is pumped from the base of the lower dam up into the treatment facility.

Cofferdam off Fishkill Road (10/2007)

Lower reservoir dam (10/2007)

## Access to the Dams

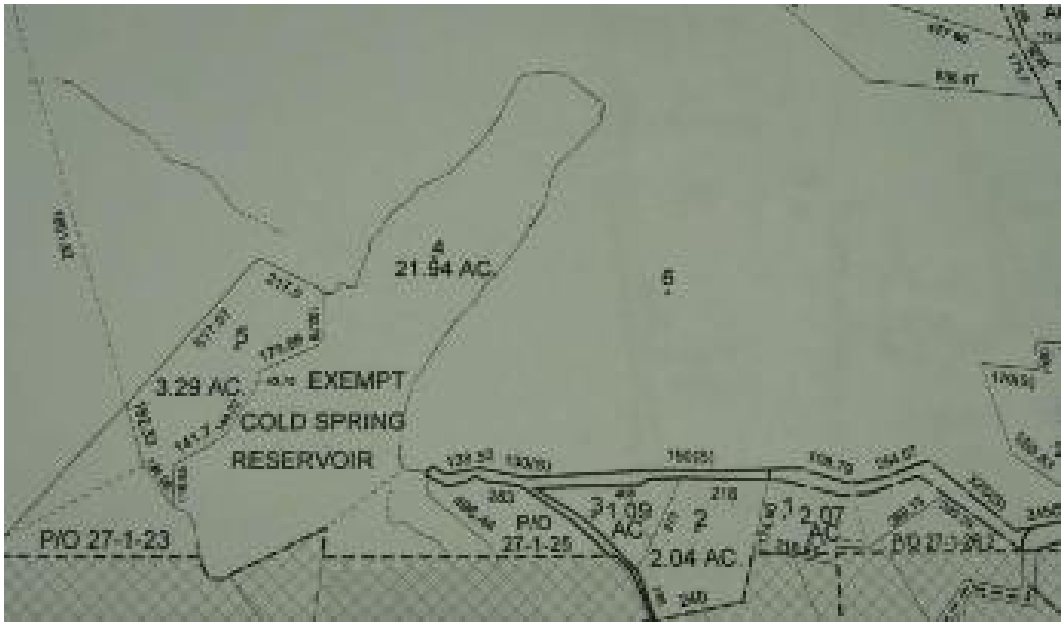
The upper dam has no public vehicular access. The Water Department has a verbal arrangement with the caretaker of a property on Lake Surprise Road (tax parcel 27-1-24) to gain foot access to the western end of the dam. Vehicular access is via an old unpaved road that starts east of Ethel's Lane on Foundry Pond Road and goes approximately due west to the eastern end of the dam. However, the lower section of this old road is impassable due to numerous large fallen trees, so recent access has been over the former "Russian Camp" (tax parcels 27-1-26.1 and 16-1-1) to meet the old road (see section of Map 16 Block 1 below). Access in recent years has been limited to minor maintenance and boat access to apply copper sulphate for algae control. The site of the old "Russian Camp" and two adjacent parcels are currently being developed into a three or four house subdivision, so there are unresolved questions about the Village's future access to the dam. Tax maps show Faust Court extending as a mapped road between parcels 27-1-25 and 16-1-3 to meet the old road very close to the dam, but the Village has not used this for access in recent years.

The middle dam on Foundry Pond Road and has easy access from the town-maintained road. The cofferdam and lower dam are easily accessed from Fishkill Road and the village property.

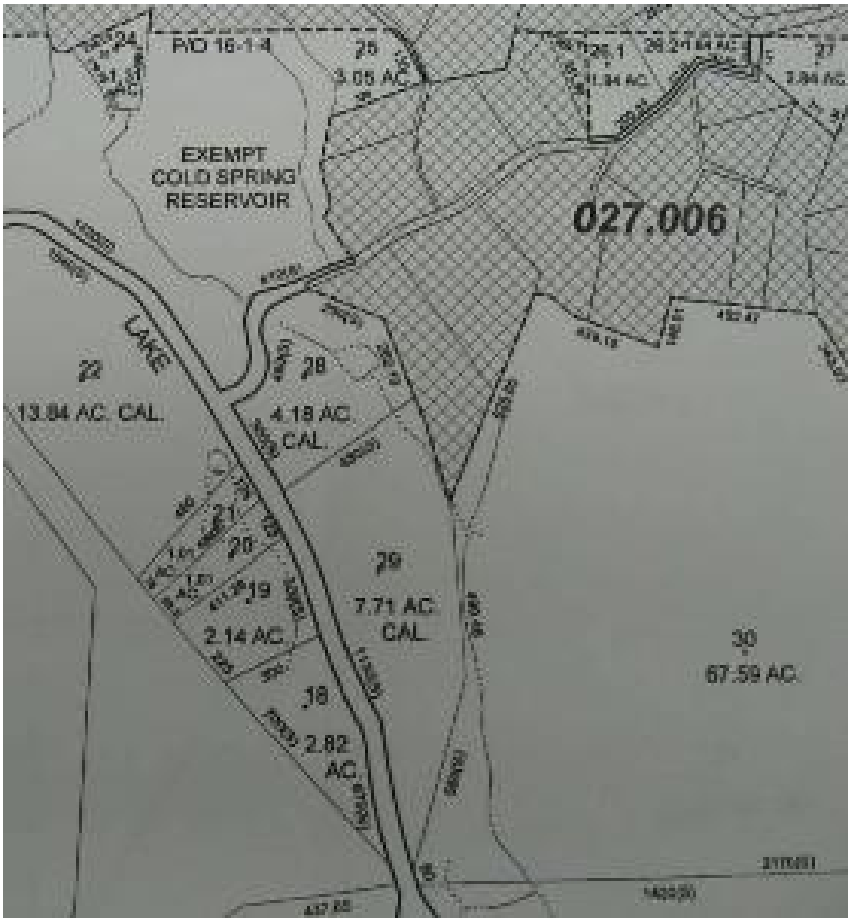
## Property Ownership in the Water Supply Area

Although the village owns the reservoirs, all the surrounding property and the property through which the brook flows is privately owned. The village owns a buffer area around the lower reservoir, but the land to the water's edge around the upper and middle reservoirs is privately owned.

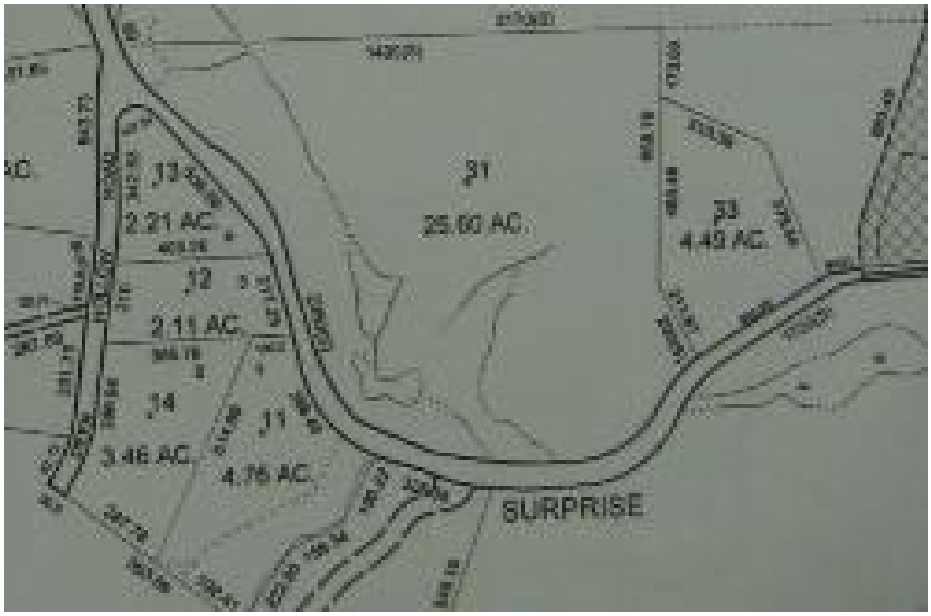
Much of the property surrounding the upper and middle reservoirs and the Foundry Brook has changed ownership recently and is under increasing pressure from development. For example, the 502 acre parcel that surrounds the upper reservoir was purchased in 1998 by PRM Realty Group, a Chicago-based real estate development company, which owns additional land within the Foundry Brook Watershed/Lake Valhalla area totaling 1,200 acres. The developer has plans to build luxury single-family homes here (see http://www.lakevalhallaestates.com).



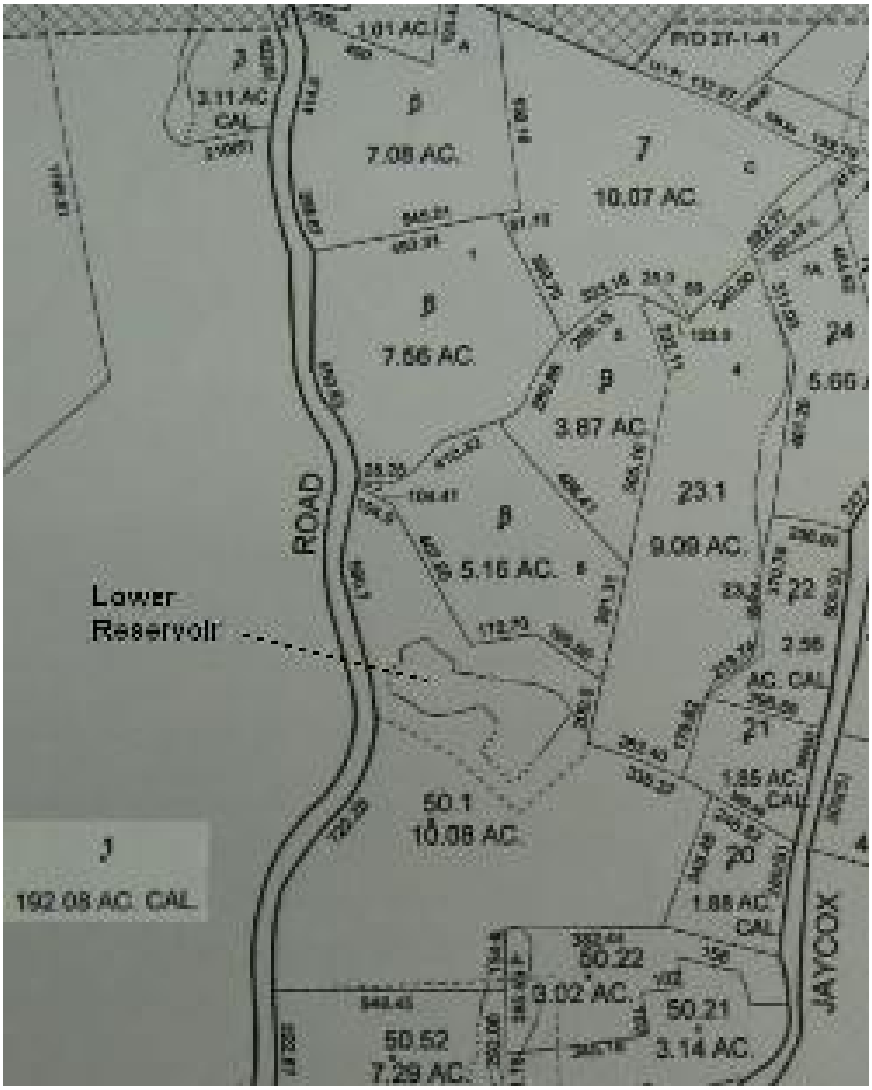

Map 16 Block 1 (Upper Reservoir and old access roads)




Map 27 Block 1 (Middle Reservoir and Upper Foundry Brook)




Map 27 Block 1 (Foundry Brook along Lake Surprise Road)




Map 38 Block 2 (Lower Reservoir)

## Flow along Foundry Brook

Foundry Brook is fed by a pipe outflow from the middle reservoir. The Water Superintendent maintains at least a trickle flow into the brook throughout the year to prevent the bed from drying out. If the brook runs dry, it takes a considerable amount of water to restart the flow to the lower reservoir due to ground absorption.

Water exiting the middle dam to feed Foundry Brook (note the crumbling pavement) (10/2007)

From here, the brook flows through private property along a path roughly parallel to Lake Surprise Road. Additional tributaries feed Foundry Brook.


Upper Foundry Brook and Lake Surprise Rd (note artificial pond just below reservoir) (Google Earth 10/2007)


Foundry Brook and lower Lake Surprise Road (Google Earth, 10/2007)


Foundry Brook along Fishkill Road (Google Earth, 10/2007)

## Protection of the Water Supply

The upper and middle reservoirs do not qualify for protection as a designated wetland under DEC Wetlands Protection Article 24 since this applies to shallow waterbodies only (i.e. wetlands). The upper and middle reservoirs do qualify for protection under Article 15, but these protections apply only to the body of water and any tributaries with year-round flow, but not to any of the surrounding areas.[3]

The brook has DEC designation of A(T), meaning drinking water supply and a trout stream. State law prohibits activities like damming or excavating the brook, but these laws generally apply only to the edge of the brook.

Philipstown local law (Chapter 93: Freshwater Wetlands and Watercourses) provides protections to wetlands and watercourses and prohibits certain activities within 100 feet of a watercourse, including dumping of rubbish, use of pesticides, fertilizers, and de-icing materials, and discharge of stormwater runoff. The town has a designated Wetlands Inspector whose job it is to enforce these laws. The Department of Health regulates setbacks for septic systems.

Despite these protections, during a brief survey of the Foundry Brook watercourse several potential violations were noted. I plan to contact the Village Board to recommend as a first step that they contact all property owners along the brook to inform them of the existing laws.[4]

Spots like this are where are water supply is most vulnerable to pollution (10/2007)

Several years ago, Putnam County investigated piping a section of Foundry Brook but they were not allowed to because of its designation as class A (T) watercourse. The DEC confirmed this would be the case, and that a natural stream in more beneficial anyway, since piping and culverts eliminate natural processes that improve water quality. Any place where a road crosses a designated stream requires a permit from the DEC. Any development near the stream must include a storm water management program to remove pollutants and reduce flow rates during heavy rainfall.[5]

## Water Treatment Plant and Distribution System[6]

The plant was constructed in 1997. Prior to this water was simply chlorinated and delivered to the village. Now, raw water is pumped up from the base of the dam and into the treatment facility. The treatment plant can deliver 1.5 million gallons per day.

Pump house and water treatment plant (10/2007)

The automated facility uses a Siemens Trident system. This consists of upflow adsorption clarification through a floating bed of rough beads, followed by mixed media filtration through a layered bed of anthracite, sand and garnet, followed by disinfection. The facility has three identical units: typically two run at a time with the third as a backup.

Prior to entering the clarifier, chemicals are added to promote coagulation: coagulant (adjusts the charge of the particles) and polymer (makes the beads sticky).

Raw water inflow pipes and chemical feed room (10/2007)

Aggregation of small particles and solids capture occur in a 4-5' bed of buoyant beads contained in the clarifier section. Beads are scored and irregular (increases surface area) and get sticky from the polymer. Sediment sticks to beads and this removes about 80% of the solids from the raw water. Water goes into bottom of upflow clarifier, goes up through beads which are retained by a fine mesh screen. Pressure switches measure the amount of force it takes to push water up through the clarifier. Water then flows down through the mixed media bed, where each layer of filter media has a progressively smaller size.

Both the clarifier and filter are periodically cleaned using an air-water flushing system. Flush cycles are initiated automatically by pressure switches, timers, or turbidity monitors, or manually. Finished water from the storage tanks to backflush the filters. Wastewater from the backflush process is sent to settling tanks and clear water is decanted off and returned to the raw water intake. Occasionally the beads must be removed and washed chemically (caustic soda hydroxide bath overnight then flushed/rinsed). Sludge (dirt) is removed from the settling tanks once or twice a year by pump truck. Cost is 13 cents/gallon = $8,000 per year. Originally they used a drying/bagging unit and transferred the dried sludge to a dumpster for removal. This was very labor intensive and there were still significant costs associated with sludge removal, so the new system is much more cost effective.

After filtration, sodium hydrochloride (bleach) is added for disinfection, sodium hydroxide for pH adjustment, and zinc orthophosphate to coat the pipe linings to reduce water discoloration. Chlorine?

The system has continuous monitoring of pH (inflow and outflow), turbidity (throughout), and chlorine (outflow). Turbidity (clarity) on the outflow is always well below allowable levels, but this is necessary because we're putting the clean water into an old system where it's going to pick up turbidity from the pipes. Finished water is pumped to the two storage tanks (530,000 gallons total).

The system runs automatically under computer control and pages the operator automatically if there's a problem or if thresholds are exceeded. The data system lets you monitor the process on a PC and includes a remote monitoring capability. The facility has an onsite emergency generator for use in the event of a power cut.

[SEE APPENDIX A FOR 2007 WATER REPORT]

Automated control system and real-time monitoring (10/2007)

The biggest problem at the plant has been corrosion due to the high moisture level in the air. Also, moisture getting into pneumatic valves has caused failures. They are currently installing a dehumidifier to rectify this. Once installed they will scale down the rust and recoat the pipes, etc. and they should stay that way.

Electric usage at the plant is significant but much less than at wastewater plant. The water treatment plant runs about 8-12 hours per day. On/off cycles are automated based on levels in the tanks. The original plan was to keep the tanks at a constant level to keep even pressure in the system but the tank manufacturer recommended not maintaining a constant level since there is risk of icing in winter, so it now cycles automatically based on programmed high/low levels.

The treatment facility has a small in-house lab measuring for turbidity, pH, and chlorine. These are primarily checks to make sure online monitoring is valid, but devices are also used in the field. There is also a backup generator to keep the plant running during a power outage.

## Water Distribution

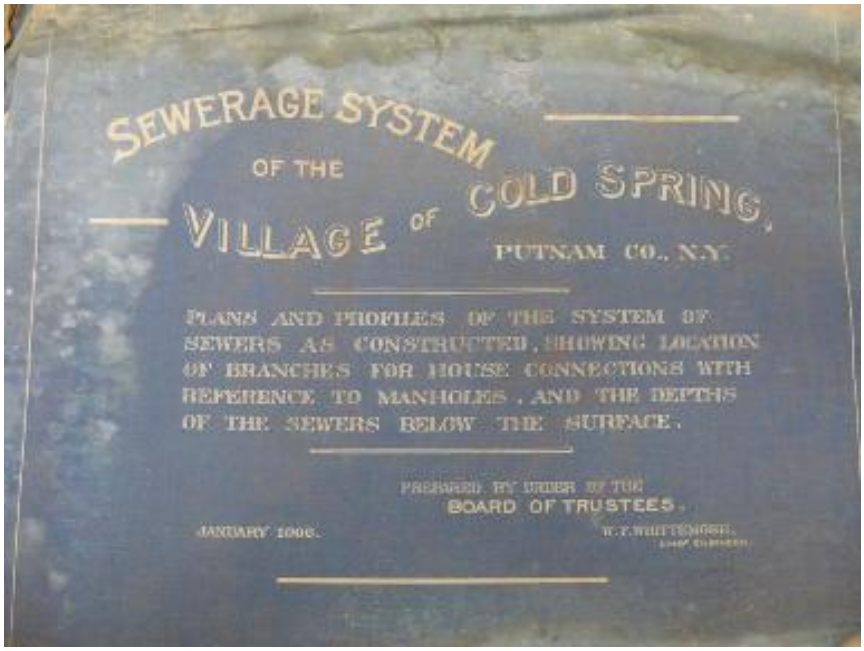
The water treatment facility has two storage containers that store a total of 530,000 gallons of finished water. From here, water is gravity fed to the village. We did not have a map of the water lines at the meeting but will review later.

Most of the supply lines are 100+ year old cast iron. A few newer sections are PVC. Main Street is 10" piping, while most of the distribution lines off Main Street use 6" piping. Water lines are generally 4-6 feet deep, so relatively easy to view and assess their condition, which is considered to be good. [NEED TO ADD HOW OFTEN LINES ARE FLUSHED]

The 6" water lines are unable to deliver sufficient volume for the fire company's trucks, so in the event of a large fire they would runs lines out from the Main Street line.

## Wastewater Collection and Treatment[7]

The wastewater collection system dates back to the early 1900s. The Village Clerk has a set of maps from 1906 showing the original layout. We do not have detailed, up-to-date maps of the current system, though most of it is unchanged from the original system. The most recent map is diagrammatic in nature, several lines are missing, and it does not include individual connection points, pipe dimensions, pipe depth, or age of lines.




Original blueprints of village sewer system (10/2007)

The wastewater treatment facility is located on Fair Street and was built in 1972. There have been upgrades to many of the pumps and blowers since the original installation.


Wastewater treatment facility on Fair Street (10/2007)

## General Wastewater Flow

Wastewater from the area of the village uphill from Garden Street is gravity fed to the treatment plant via Main Street and Garden Street.

In the Main Street area below Garden Street, wastewater is gravity fed to the West Street pump station, which pumps the waste back uphill to join the main Garden Street line. Another pump station on Kemble Avenue services Benedict Road, Kemble Avenue, Constitution Drive, The Boulevard, and Forge Gate, and another smaller pump station by the Metro North parking lot services Market Street. All of these pump stations pump the wastewater uphill via new sewer lines to connect to the main gravity fed line along Garden Street. The Grandview Terrace/Hamilton Avenue area gravity feeds directly to the treatment plant.

## Condition and Maintenance of Wastewater Collection System

Most of the sewer lines are the original 100+ year old tile pipes – 20 inch sections of clay pipe that fit together with flanges. With this system, roots get into the pipes via the joints and lead to grease clogs. Newer lines, including those from the three pump stations are PVC???

Although the system is old, it is considered fairly intact. There are no serious clogging or backup issues that would indicate major root infiltration or other blockages. There has been only one instance in recent years of old piping collapsing. In this case, the section had to be replaced. Repairs of this type are very expensive, so replacing the piping network street-by-street would be prohibitively expensive. It is possible to line old sections of piping with an inflatable liner, but this is expensive too.

The village conducts visual inspections of the sewer lines via manholes and uses these to monitor flow rates and identify backups or major leaks. They keep a record of incidents to help identify problem areas. It is impossible to assess the condition of the piping as it's buried 8-18 feet below ground. Video inspection is expensive ($1,500 per day) and is only used when a problem section has been identified.

Village has a trailer jetter and visits each street once every 8-12 months to blow the sewer lines clean (grease clogs mainly). There is a need for public education to inform residents about problems caused by household grease and items like "disposable" wipes, which also cause problems at the wastewater treatment plant. Businesses are required by law to have grease traps.

## Known Issues

The village maintains separate stormwater and wastewater collection systems. This is known as a Municipal Separate Storm Sewer System (MS4). However, there is a major problem caused by inflow and infiltration ("I+I") of stormwater into the wastewater collection system. This has caused hydraulic overload situations where the quantity of water reaching the treatment facility exceeds the capacity of the system and the effluent being discharged into the river has been outside permitted limits (a violation for which the village could be fined).

The village recently conducted smoke testing smoke testing to identify inflow from illegal connections of downspouts to the sewer system and infiltration due to broken pipes. However, testing identified only a small number of illegal connections that could account for only a small percentage of the total inflow during heavy rains. The firm that conducted the testing suggested there is probably a lot of inflow through manhole covers and recommended inflow prevention lids. These cost around $70 each. The area that seems to see most I+I is

the Main Street area below Garden Street, since the West Street pump station usage spikes severely during heavy rains.

Another sewer issue exists on Parrott and West Bank Streets, where an unmapped sewer line runs through a number of back yards on the south side of Parrott Street. This line services the houses that cannot use the main Parrott Street line because they are downhill of the line and can't gravity-feed into it. The area where the line runs has many large trees and has been built over with sheds and pools. There are no manholes and it is impossible to access in sections. The issue of maintaining this line has not been resolved. Additionally, a couple of new houses on West Bank have temporary septics because they can't reach a sewer line.

## Wastewater Treatment Facility

Treatment plant dates to 1972 but was upgraded recently with variable frequency drives on pumps to run more efficiently, new blowers to the aeration tanks, etc. Before 1972, raw sewage was discharged directly into the Hudson.

The plant can handle 500,000 gallons of wastewater per day. The actual amount is approximately 260,000 gallons per day, but this can spike to 760,000 gallons per day during heavy rains, leading to a violation condition where the effluent does not meet the required standards (see "Known Issues" above). Once the "inflow and infiltration" issue is resolved, the plant should have plenty capacity and could potentially handle wastewater from Nelsonville, which has no municipal sewer system.

The first stage in the process is the removal of solids, like rags and "disposable" wipes. An auger unit was installed in 2004 to automate this process and make the system run more efficiently. The auger unit is located in the wet well (the head unit that receives the raw inflow) and is supposed to grind up the solids in the raw sewage, spray them down to remove the organics, and extract the solids from the flow. But the pressure head on the inflow pipe is insufficient to drive the solids through the grinder, so it clogs and backs up, and organics end up going through the system in surges, rather than in a continuous flow as is required for efficient operation. So because of these backups the auger is being bypassed and they remove solids manually from a screen. Additionally, the location of the auger motor is subject to flooding and has burned out.

The Water Superintendent plans to relocate the auger unit downstream of the initial raw sewage pumps (located in the machine room in the basement of the facility) where there is plenty of pressure. This will also make the auger easier to access for maintenance. Relocating the auger unit will not help the raw sewage pumps, but these are large and not as susceptible to problems caused by solids. However, it will help everything downstream of the auger unit, especially the sludge return pumps, since solids in the sludge bind up the impeller and make these smaller pumps less efficient and susceptible to overheating.

Auger unit currently located in wet well (rags removed manually) (10/2007)

Once the solids have been removed, the raw waste is pumped to the aerated grit chamber. Pressure transducers (with float switch backups) in the wet well determine how many of the three raw sewage pumps are required to be operating at any given time. In the grit chamber, sand and grit settles out, and this gets removed several times a year.

Two of the three raw sewage pumps (10/2007)

Aerated grit chamber (10/2007)

The treatment facility is an activated sludge plant that uses aerobic microorganisms and dissolved oxygen to break down the organics in the sewage. Treatment is basically 2-step process:

1. Mix it up (in the aeration tanks).
2. Settle it out (in the clarifiers).

Aeration tanks (10/2007)

Clarifiers (10/2007)

Blowers in the machine room force air into the aeration tanks through diffuser arms. The airflow provides mixing to maximize contact between the organisms and the raw waste, and also provides the dissolved oxygen the bugs require. The dissolved oxygen level is monitored and adjusted manually 2-3 times a day. The total capacity of the aeration tanks is 500,000 gallons.

In the clarification tanks, the solids settle out. In the tanks, a set of arms skim the foam from the surface and then return along the bottom of the tank to bring the solids along to a collection pit. Since these solids are mostly bugs, and these are required to keep the system functioning, a portion of them are returned to the aeration tanks via pumps located in the machine room. The remainder of the sludge is pumped to the digester.

Arm skimming the surface of the clarifier (10/2007)

Digester (10/2007)

In the digester, the solids settle out and the water is decanted from the top and returned to the aeration tanks for treatment. Sludge builds up and eventually has to be removed. Until mid 1980s, the village used two drying beds and then trucked the dried sludge to the Philipstown landfill. Since the landfill closed, the most cost effective way is to pump out liquid sludge every 6-8 weeks and transport it to Beacon for processing. The service is outsourced to All County Waste Management at a cost of 14 cents per gallon (about $25K+ per year).

The clear water from the clarifiers is sent to the chlorine contact chamber. Between May 15 and October 15 the plant is required to treat the outgoing clear effluent with chlorine. Outside of these dates, no chlorination is required, so a bypass channel sends the water directly to the discharge point.

Chlorine chamber ready for winter maintenance (10/2007)

Bypass in effect outside of May 15-Oct 15 (10/2007)

The treatment facility has a small in-house lab for daily testing of the effluent water as required for compliance (solids and pH). The lab also measures dissolved oxygen and solids in the aeration tanks and the clarifiers for process control. A chart recorder records the raw inflow rate, the return sludge rate, and the aeration flow rate.

Effluent testing (10/2007)

Process monitoring (10/2007)

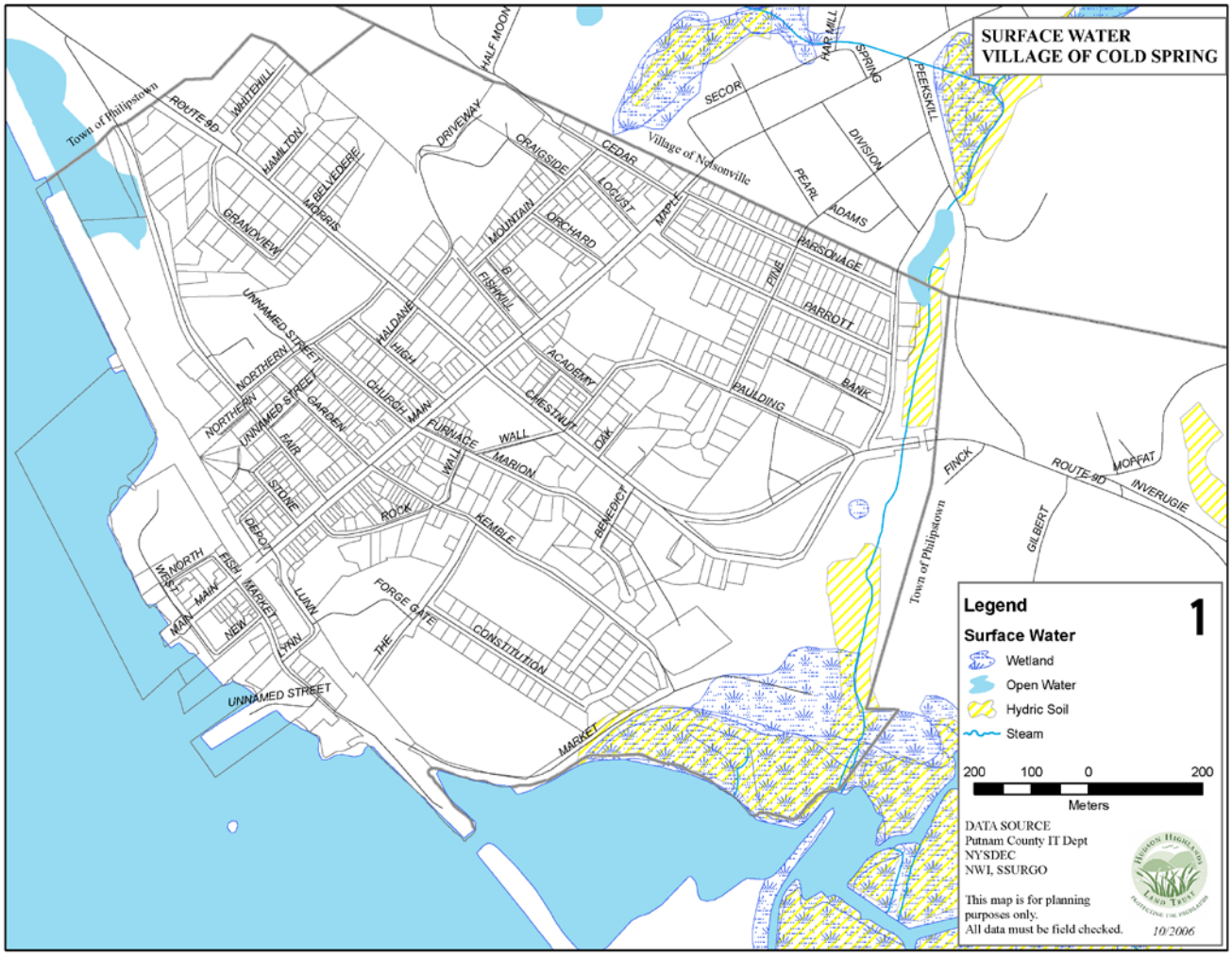
## Surface Water and Stormwater Management

All surface water in the village drains into the Hudson River, Foundry Cove, or the cove beyond Mayor's Park. Stormwater from Main Street, sections of 9D, and the side streets that pitch toward these main roads is captured and piped to the river, while street runoff from the rest of the village just flows downhill to the nearest watercourse or natural catch basin.

Current federal and state stormwater management regulations do not require permitting to discharge untreated stormwater and street runoff in this way since Cold Spring does not lie within a regulated area. Although Philipstown is within the regulated area, Cold Spring, as a separate municipality, is not.[8]

### Mapped Watercourses

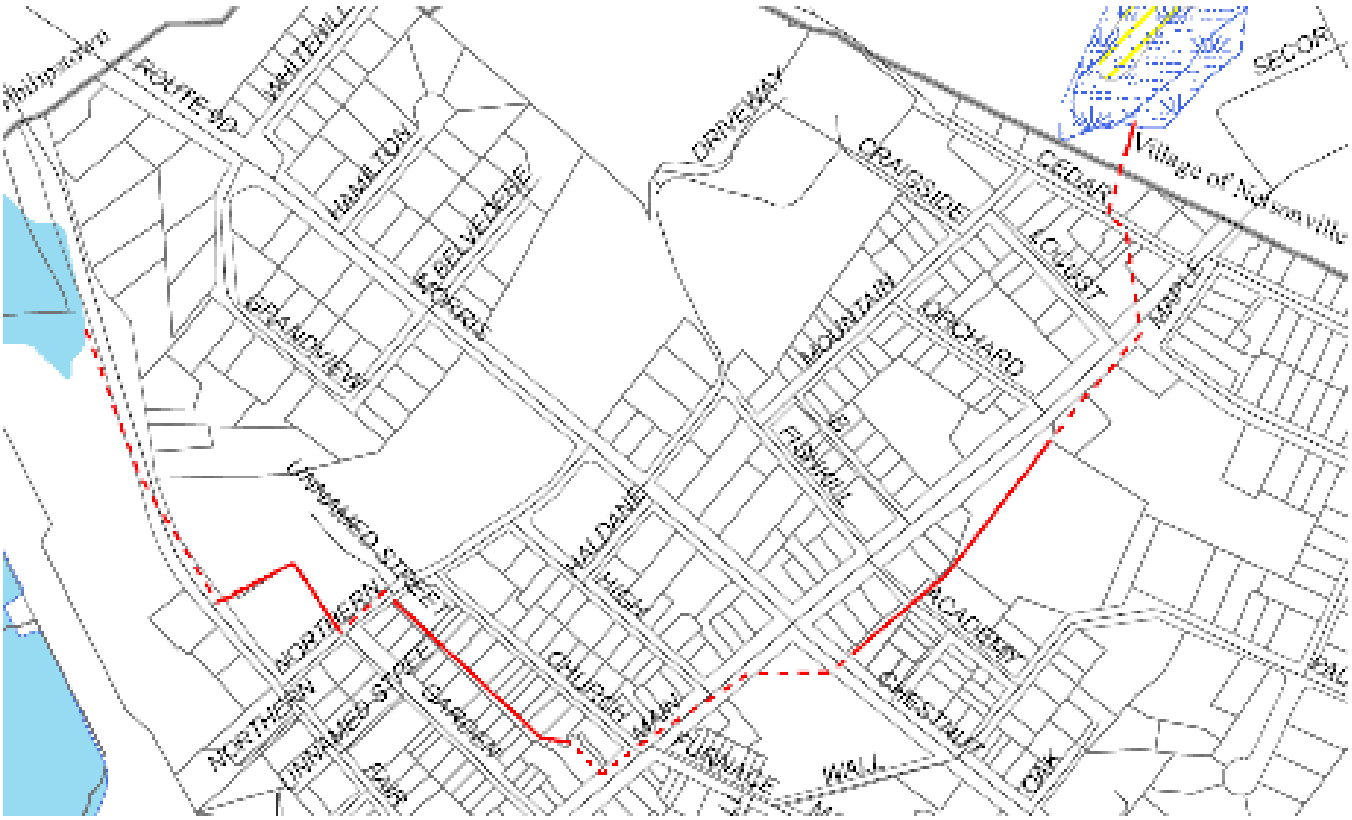
The only mapped stream in Cold Spring is Foundry Brook, which flows just inside the village's eastern boundary, through the site of the West Point Foundry, and into Foundry Cove.




Mapped watercourse through village (Hudson Highlands Land Trust 10/2006)

## Back Brook

There is an unmapped, intermittent stream, known locally as "Back Brook" (also known as "Margaret's Brook" although there are historical references suggesting that Margaret's Brook is Foundry Brook), that flows through the village from Cedar Street and eventually into the cove north of Mayor's Park.[9]

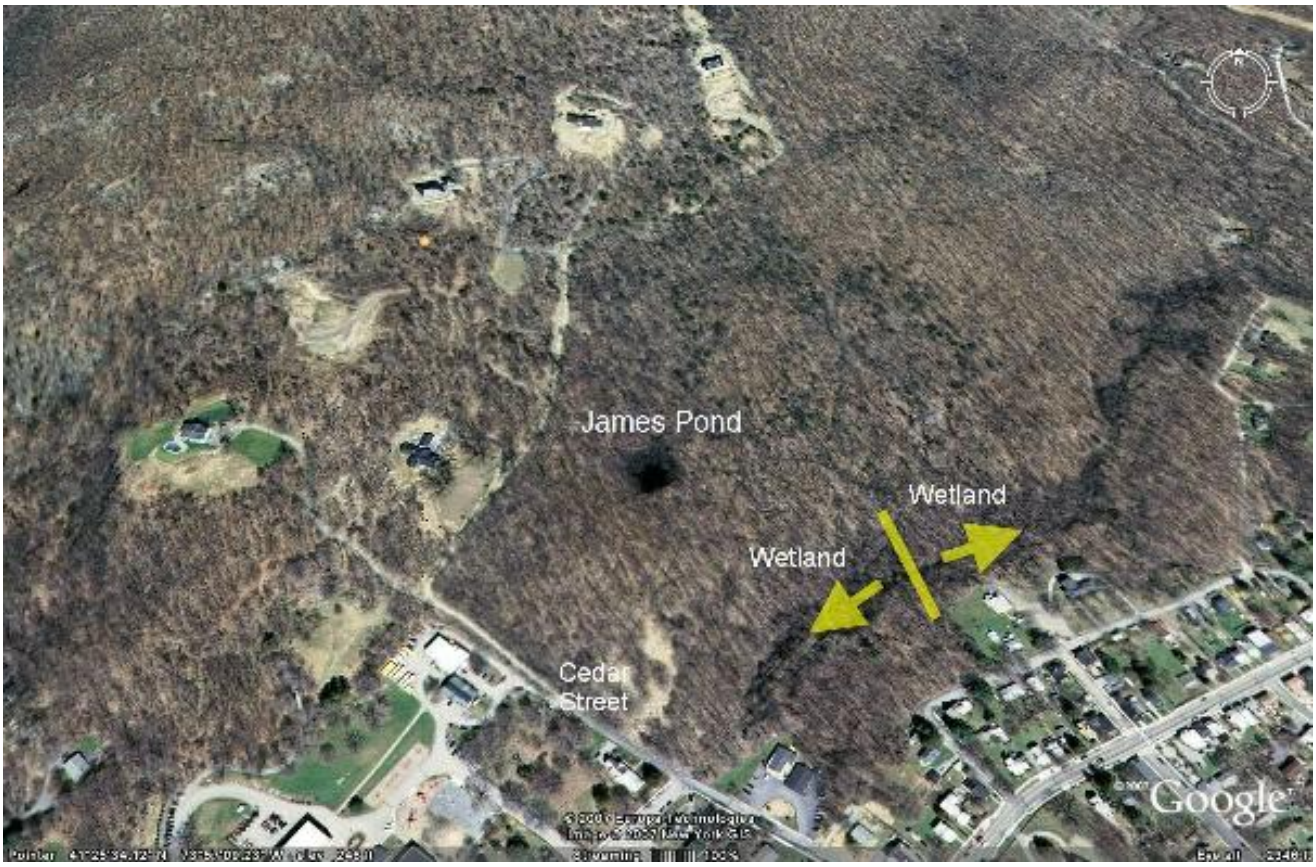



Approximate path of "Back Brook" (dotted sections run underground) (Peter Henderson, 10/2007)

Although no longer shown on current maps or identified in any DEC watershed data, Back Brook has a documented history going back the 19th-century.


1876 ”DeBeers”map showing “Back Brook”

The start of Back Brook is in Nelsonville behind the American Legion property on Cedar Street. The aerial photograph below shows the area of wetland that feeds the brook. Note that the SW end of the wetland area empties through Cold Spring while the NE end empties through Nelsonville and ultimately joins Foundry Brook.




James Pond and area north of Cedar Street that feeds Back Brook (Google Earth, 10/2007)

The brook flows only intermittently, depending on weather conditions, although the quantity of water reaching the brook has increased in recent years due to the removal of trees and the increase in impervious surfaces on the hillside behind the Haldane school property where a number of new homes have been constructed. There is evidence in the wetland area to suggest that drainage ditches were constructed in the past to direct the flow, but it's not clear whether this was to feed additional water through Cold Spring (before the days of piped municipal water the brook was probably used for laundry and other household chores) or the other way to Foundry Brook (water in the brook powered the foundry operations).

Back Brook is piped under Cedar Street, under a few properties on the south side of Cedar Street, under the Montessori School property on Main Street, under a short section of Main Street, and then surfaces on other side of Main Street. From here it runs parallel to Main Street and then behind the back of the properties on the south side of Main St (across private property), under Academy St, and across property at 166 Chestnut Street.

The start of "Back Brook" on Cedar St. (10/2007)

"Back Brook" by Academy St. (10/2007)

The brook is piped under Chestnut Street (9D), under the corner of the Episcopal Church property, and down the edge of Main Street to the jewelry shop. From there it goes diagonally under Main St. and continues down Main Street to the point between Church and Garden Streets where it branches off and goes above ground between the properties on those two streets. It then goes under Northern Ave and through the Springbrook Condominium property, and is then piped under Fair Street, along the edge of Mayor's Park and into the cove.

Between Church and Garden St. (10/2007)

Back Brook through the Springbrook Condominiums (10/2007)

Although once a natural stream, sections of the brook have been diverted through ditches and otherwise irreversibly transformed over the years as Cold Spring has been built up. There is little natural habitat left to protect through the village. The stream is severely constrained by drainage structures, with little or no floodplain remaining for the stream. Restoring the stream to a pre-existing "natural" condition would be impossible because the floodplain is now occupied by houses, parking lots, roads, and other structures typical of urban environments. The DEC (Department of Environmental Conservation) uses the term "urban stream syndrome" to describe this situation of ecological degradation where streams flow through urban land. Because of the lack of natural habitat and because of the stream's intermittent flow, the brook no longer meets the DEC criteria for mapping as a protected watercourse.

Representatives from the DEC who made a site visit[10] identified one area along the brook that might benefit from some rehabilitation. This is the section through the Springbrook condominiums, where little or no natural vegetation exists along the stream bank and the bank is eroding. Planting of natives shrubs and other plants along the edge of the brook could help prevent further erosion. A DEC Hudson River Estuary Program, known as "Trees for Tribs" exists that can assist with getting suitable plantings for the site, if volunteer labor and local support is offered.

Some of the piped sections flow through the original 19th-century slab piping, which consists of a gravel base, stone sides, and a stone cap – construction matching that used at the West Point Foundry. During one site visit, there was water flowing in the upper section of the brook but the lower section where the flow exits the stone culvert between Church and Garden Streets was dry. This suggests possible diversion into the storm drain system or infiltration into the ground through the culvert base.

Although there have been incidents of flooding at different points along the brook, the DEC saw no major flooding problems. There is occasional flooding (once a year or less) at various points but they consider this minor compared to many other Hudson Valley communities.

There are several points of constriction along the brook. The first is at Cedar Street where the flow first goes underground. Based on flooding in that area, it is possible the pipe may be too small to handle peak flows. However, the entry point is frequently constricted by leaves, branches and other debris so the flooding could be caused by that; further investigation is required, and enlarging the pipe may simply push the problem downstream where areas would be subjected to higher flows. The same applies to other constriction points.

In April 2007, the entrance to the piped section by Cedar Street (in Nelsonville) became partially clogged with branches and debris, and the whole basin area flooded causing flooded basements and other water damage. FEMA reviewed the damage but declined to assist, apart from $1,116 for labor and equipment used to clear catch basins.

At the point where the brook resurfaces between Church and Garden Street the DEC noted a lot of silt in the channel. The brook jumped the bank and flooded a few Garden Street properties in the spring of 2007. The DEC suggested digging out the silt and building up the channel sides but pointed out that this is not a long term solution as it will force the high flows somewhere else, perhaps onto another neighbor's property. A "rain garden" at the back of the flower shop parking lot might help improve ground absorption at that spot but a proper hydrological study is required before making any changes.

There are points where the built-up embankments along the edge of the brook are in danger of collapse. The most serious appears to be at the point where the brook goes under Chestnut Street (9D), on the property at 166 Chestnut Street.

<<Need photo of 166 Chestnut Street embankment>>

The DEC[11] suggested the village could look into acquiring easements over those properties to do maintenance work, or enforcing existing laws to ensure property owners perform maintenance chores. If the code is lacking in that respect, the village can consider a new ordinance, but this would most likely need to be done in conjunction with a proper hydrological study.

The DEC emphasized that management of the brook is a local village issue since it is not a mapped watercourse. They suggested identifying the owners of the properties along the brook and conducting a survey asking questions like:

- Do you like the brook?
- What do you like/dislike about it?
- Are there any flooding issues?
- How could the village help you manage the brook?

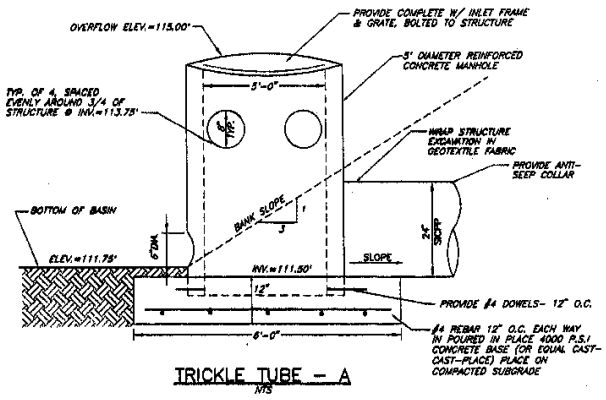
They suggested a drainage planning study conducted by an independent consultant to look at the flow during heavy rains, identify problem spots, and suggest remedies. They also suggested implementing a local stormwater law.

## Water from Haldane

A large amount of water comes off the Haldane school property and into the catch basins on Craigside Drive and Morris Avenue (9D). When the new high school was constructed, the school was required by NYS law to implement a stormwater management plan. The water management system includes two detention ponds: one above the football field and one below the football field. Water from the area around the new high school and the upper parking lot runs into the upper pond and discharges through a "trickle tube" system to the lower pond. The lower pond discharges through a second "trickle tube" system into a catch basin on Morris Ave.

The "trickle tubes" are designed to slow down the rate at which water is released from the ponds. At the bottom of each trickle basin is a six inch hole that allows water to ''trickle'' out of the basin. During the average rainstorm, water is collected in the detention basin and released slowly, allowing the water drain over a period of time. Further up on the trickle basin are four six inch holes positioned so runoff from the "10 year storm" is released at a controlled rate, albeit faster than the normal storm. The grate at the top of the trickle basin releases water from the "50 year storm" and is designed so the detention basins do not overtop and flood 9D.[12]

Lower detention pond beside Morris Ave (9D) (10/2007)




"Trickle tube" design (Haldane School)

Stormwater from the Haldane elementary playground area is captured in catchbasins and piped underneath the school property and then discharged to flow along the edge of Craigside Drive. Water flows into a catchbasin at the foot of the Craigside Drive and then joins the main stormwater piping under Morris Ave.

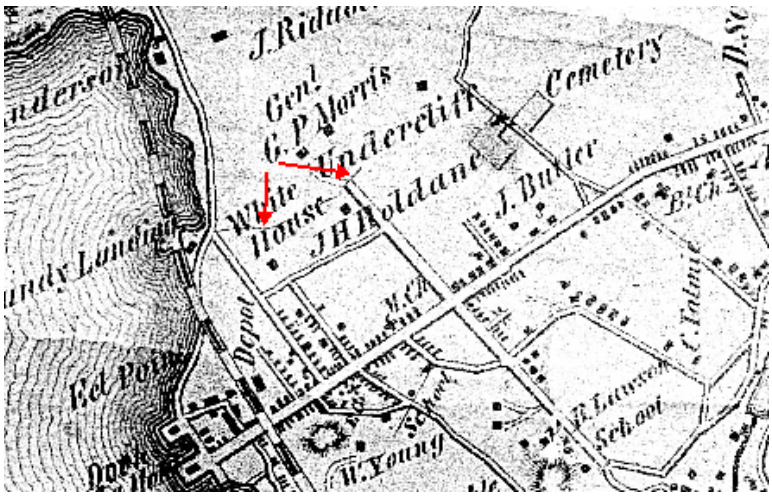
The Craigside Drive catch basin is undersized for the quantity of water is must handle during heavy rains and sometimes overflows, creating flooding on Morris Ave. The village applied for a $25,000 NYS grant to redo the catchbasin and the piping under Morris Ave, which is also inadequately sized. The grant would also cover widening of Morris Ave for school dropoff.

## [Addendum added 2/19/08]

There is an almost constant flow of water down Craigside Drive that does not appear to be stormwater runoff since it is present during dry periods. The school has investigated suggestions that this flow is condensed steam being discharged from the school heating system and has concluded that any water from the heating system represents only a small percentage of the total flow. The school's facilities manager has quantified the leakage from the heating system and the leakage into the catch basin. Based on measured losses from the heating system, they are losing about .17 gpm (gallons per minute) from the heating system. The catch basin is filling at

the rate of 3.45 gpm. Thus, the heating system is only contributing about 5% of the flow. The water has been tested for chlorine by the Village water department and does not show any trace of chlorine.[13]

The map below is from an 1854 O'Connor map and shows a watercourse running from the Haldane property down to the river. This stream no longer exists so it may be possible that this flow was diverted at some point in the past and is contributing to the flow down Craigside Drive, although this is pure speculation at this time.




1854 O'Connor map showing stream on Haldane property

## Northern Avenue and Springbrook

The two flows from the Haldane property (via the playing field detention ponds and Craigside Drive) combine with the street runoff from 9D and are piped down Northern Ave. The Northern Ave stormwater then combines with the water from Back Brook and flows through the Springbrook condominiums, under Fair Street, and into the cove.

Brook through Springbrook (10/2007

Brook entering piping under Fair Street (10/2007)

## Chestnut Street/Benedict/Marion Ave

Catchbasins along Chestnut Street from St. Mary's Church to Chestnut Ridge capture street runoff from 9D and the Foodtown parking lot. Piping transports this runoff under Benedict Road and the Marion Ave extension and discharges it into a rip-rap gulley that empties into the Foundry Cove.

Stormwater gulley off Marion Ave ext. (10/2007)

Discharge point at Foundry Cove (10/2007)

Surface water from the Post Office runs down Benedict to a catchbasin at the end of the street and is then discharged down the slope towards Foundry Cove. There is considerable runoff from the "Main Course" commercial area that runs down Marion Ave, Wall Street, and onto Kemble Ave, where it causes flooding.

## Main Street Area

A series of catchbasins down Main Street (301) captures street runoff (including surface pollutants and trash) and pipes it under Main Street to the river, where it's discharged from the end of the dock beyond the bandstand. Catchbasins at the end of most side streets capture water from the side streets and send it to the Main Street line. About 20 years ago, the section of pipe from Kemble Ave down to the railroad tracks was replaced because the bottom of the pipe was completely deteriorated due to cadmium from the battery plant.[14]

Of the side streets, only Fishkill Avenue has catchbasins and piping. On all other side streets that pitch towards Main Street, water flows over the street surface and into the Main Street catchbasins.

## The Rest of the Village

Constitution Drive has dry wells that were installed by a private contractor when the street was constructed. The village now handles the maintenance of these dry wells. Forge Gate has catchbasins and piping that discharges into the woods behind the railroad tracks. The Marathon battery plant site has three catchbasins that catch most of the water from the field and take it to Foundry Cove through piping.

All other sections of the village lack any stormwater capture system, so water flows over the street the surface. The northern sections of Fair, Garden, and Church Streets pitch towards Northern Ave. The Parrott/Parsonage area drains into the Foundry Brook. The Hamilton/Belvedere area drains towards Mayor's Park. Mountain Avenue drains to the catchbasin on Fishkill Road.

Typical street drainage (Paulding Ave) (10/2007)

Problem spot by Maple Terr. stairs (10/2007)

# Appendix A – 2007 Water Report

[INSERT COPY OF 2007 DRINKING WATER ANALYSIS]

# References

[1] Information provided by Greg Phillips, Water Superintendent, Village of Cold Spring

[2] Information provided by Greg Phillips, Water Superintendent, Village of Cold Spring

[3] Information provided by Scott Cuppett, Watershed Program Coordinator NYS Dept. Env. Conservation

[4] Observations by Peter Henderson, Oct. 2007

[5] Information provided by Scott Cuppett, Watershed Program Coordinator NYS Dept. Env. Conservation

[6] Information in this section provided by Greg Phillips, Water Superintendent, Village of Cold Spring

[7] Information in this section provided by Greg Phillips, Water Superintendent, Village of Cold Spring

[8] Information provided by Barbara Kendall, NYS Dept. of Environmental Conservation

[9] Locations of underground sections identified by Anthony Phillips, Mayor, Village of Cold Spring

[10] Scott Cuppett, Barbara Kendall, and Kevin Grieser of the NYS Dept. of Environmental Conservation visited on 12/11/2007

[11] Scott Cuppett, Barbara Kendall, and Kevin Grieser of the NYS Dept. of Environmental Conservation

[12] "Trickle tube" construction details from Clark Patterson Associates (Haldane School's architect)

[13] Analysis by Wayne Robinson, Facilities Director, Haldane School

[14] Information provided by Anthony Phillips, Mayor, Village of Cold Spring