BETWEEN THE ROCK AND A WET PLACE

Fletcher N. Platt, Jr., PE, PP, BCEE[1*]

[1] Hatch Mott McDonald
[*] fletcher.platt@hatchmott.com

ABSTRACT

The Borough of Hopatcong, New Jersey has 16,000 residents on the shores of Lake Hopatcong. The need for a sanitary sewer project became clear as the individual septic systems and the shallow depth to bedrock were causing groundwater and surface water degradation.

A planning effort began in 1995 with a focus on cost control, which will be discussed in detail. Construction of the $59,400,000 Phase I and Phase II collection system, which serves 2,740 homes, businesses and public facilities was completed in July 2008. Hatch Mott MacDonald (HMM) provided the engineering services for the project from the planning in 1995 through completion of construction.

KEYWORDS: Sanitary Sewer, Pump Station, Force Mains, Grinder Pumps, Collection System, septic system, feasibility study, planning, value engineering, grants

INTRODUCTION

The Borough of Hopatcong is located in the northwestern New Jersey Highlands. The Borough forms the western shoreline of Lake Hopatcong, New Jersey's largest lake. The area has served as a summer retreat for New York City and urban New Jersey residents since the mid 1850's. Hopatcong Borough experienced substantial development of summer cottages and year round homes on ¼ acre lots following World War II and has a current population of 16,000. The Borough homes and businesses were served by individual septic systems as wastewater collection and treatment facilities were not available prior to the completion of this project.

Lake Hopatcong is the headwaters of the Musconetcong River which received a federal designation as a "Wild and Scenic River" in 2006. The Musconetcong River is a tributary of the Delaware River upstream of the City of Trenton and City of Philadelphia water supply intakes. The Hopatcong sanitary sewer project has provided regional water quality benefits.

The New Jersey Highlands Region consists of a series of ridges and valleys. The Borough of Hopatcong is located on the ridge to the west of Lake Hopatcong. The bedrock ridge that runs beneath the Borough of Hopatcong consists of pyroxene granite of the Middle Proterozoic Lake Hopatcong Intrusive Suite. Locally it is known as "The Rock".

The Wisconsin glaciation removed most of the soil leaving exposed sound bedrock or only a few feet of soil in most of the Borough. The glaciation also left steep slopes (15% to 25%) in much of the Borough. The natural landscape is beautiful, but not suitable for septic systems or conducive to sanitary sewer construction.

Figure 1- Lakefront Construction

METHODOLOGY

In 1995 a feasibility study and the development of a sewer system conceptual plan were prepared. In 1997, the preliminary design of the collection system for the entire designated Town Center area of the Borough was completed.

A number of cost control measures were developed that addressed the following project constraints: 1) Protection of the lakefront, 2) Shallow depth to bedrock, 3) Steep slopes, 4) Small homes on small lots, 5) Modest income and fixed income residents.

A number of cost control measures were evaluated and implemented during the planning and design phase as listed below.

Planning Cost Control Measures

1. Reduced design flow per home from the New Jersey Standard of 300 gpd to 200 gpd.
2. Designed a combined gravity and low-pressure sewer system to protect the lakefront environment and reduce rock excavation and resultant cost.
3. Acquired the necessary grinder pumps through a Procurement Contract.
4. The Borough decided to install, own and operate the low-pressure sewers and grinder pumps to take advantage of low interest NJ Trust financing of "Publicly Owned facilities" thereby reducing the total cost to the sewer system customers.
5. Used ground penetrating radar with conventional borings to determine rock profile along sewer alignments.

6. Utilized an outside contractor to locate existing water mains.
7. Tunneled beneath the railroad embankment, rather than open cut excavation.
8. Divide the project into moderate size contracts which were bid in stages to promote local contractor competition.
9. Formal Value Engineering of the preliminary design was conducted by an outside consultant.
10. Obtained grinder pump installation and operation "Deed of Easement" by negotiation with property owners.
11. Conducted innovative project financing.
12. Conducted extensive public participation.
13. Modified the Phase II contract documents based on lessons learned in Phase I.

Public Participation

The Borough of Hopatcong has encouraged public participation in the project from concept stage, through planning, financing, design and construction. The sewer project had been on the ballot twice. A Sewer Advisory Committee was created by the Mayor and Council in 1996 and held more than 30 meetings that were open to the public. Literature describing the project and "Answers to Frequently asked Questions" was distributed. Public hearings were held prior to undertaking each of the two project phases.

Since 2000 to 2007, the sewer project was an agenda item for the Borough Council meetings and periodic status presentations were made by HMM. General project information and the project status were posted on the Hopatcong web site. To address areas of special concern, neighborhood meetings were held.

During the period of construction, a public liaison was assigned to receive calls from residents and to advise the appropriate sewer project team members of the residents' concerns. The project has benefited from the public participation and public input.

Project Phasing

In 1997 the cost to provide sewers to the entire community was estimated to be $87,000,000. Concern for the project cost and user cost was expressed by the residents.

In response to these concerns, Borough Officials pursued Federal and State grants and evaluated options to reduce the cost and financial impact for Borough residents. A phasing of the project was determined to be more acceptable to the public, minimizing the area of disruption at any given time and reducing the initial user cost. In 1999 a concept was developed to begin Phase I by serving customers in the southern portion of the Borough. This southern area was selected due to its close proximity to the Musconetcong Sewerage Authority (MSA) interceptor sewer and treatment facilities, a high rate of septic system failures in the area and portions of the area being along the environmentally sensitive shoreline of Lake Hopatcong. The Phase I area with 1,700 customers was expanded by a Phase II area in the year 2000 that serves an additional 1,040 customers. The Phase I and Phase II project areas are presented in Figure 2.

Figure 2 - Borough of Hopatcong – Phase I & II Service Areas

Project Financing

In 1999, $8,700,000 in federal grants and $5,000,000 in state grants were obtained with the support and assistance of Rodney Frelinghuysen, Congressman; Robert E. Littell, Senator; Guy R. Gregg, Assemblyman; and Alison Littell McHose, Assemblywoman. Applying these funds to the first project phase, which includes the heart of the collection system necessary to serve the Town Center area, resulted in a reduction in user charges. The sources of funds for the Phase I and Phase II projects are presented in Table 1.

Table 1 - Hopatcong Sewer Project Cost and Sources of Funds

Collection System Phase I & II Total Cost	**$59,400,000**
Source of Funds	
Federal Grant	$ 8,700,000
State Grant	$ 5,500,000
New Jersey Environmental Infrastructure Trust (NJEIT)	$15,800,000
Local Financing	$29,440,000

A low interest loan from the New Jersey Environmental Infrastructure Trust (NJEIT) in 2001 provided funds for the Phase I project which serves Hopatcong Heights, Hopatcong Hills South, Point Pleasant, Lakeside Boulevard East and the Hopatcong Center areas of the Borough. Innovative long term 30 year municipal financing was obtained to spread out the debt payment for the completion of the Phase I and Phase II projects.

The Phase II project approved by the Borough Council on February 20, 2002 consists of construction of sanitary gravity sewers, low-pressure sewers, pumping stations and force mains. The additional areas served by the Phase II contracts are Durban, Hopatcong Hills West, River Styx, the Carteret Road areas, and Lakeside Boulevard North.

Treatment Facilities

The wastewater treatment capacity required for the project was made available through a 1900 m^3/d (500,000 gpd) expansion of the Musconetcong Sewerage Authority (MSA) Treatment Plant for which a Service Agreement was entered in October, 2000. The MSA also obtained New Jersey Department of Environmental Protection (NJDEP) approval of a re-rating of the treatment plant capacity. Hopatcong purchased an additional 300 m^3/d (80,000 gpd) of available capacity, bringing the total available treatment plant capacity to 2,200 m^3/d (580,000 gpd) for the Borough. However, the Borough was only required to pay its proportionate share of the administrative cost to the MSA to obtain the re-rating that created the additional capacity. That cost was $13,017.48 which is all that the Borough paid for the 300 m^3/d (80,000 gpd). Through the re-rating allowed by NJDEP the Borough obtained almost 14% of its total sewerage capacity at virtually no cost to the system users. The MSA Treatment Plant was constructed with a combination of federal grants and NJEIT funding. The current wastewater discharge by the Borough of Hopatcong to the MSA is approximately 1440 m^3/d (380,000 gpd). The MSA's support and assistance has been a great benefit to the Borough of Hopatcong sewer project. The Borough of Hopatcong became a member of the MSA in 2006. Source of funds is presented in Table 2.

Table 2-Source of Funds

MSA Treatment Facilities Total Cost	$11,100,000
Source of Funds	
Grants	$4,800,000
New Jersey Environmental Infrastructure Trust (NJEIT)	$6,300,000

Borough of Hopatcong Water Supply System

The Borough of Hopatcong owns and operates a water supply system that serves approximately 1/3 of the residents. A portion of the Phase I and Phase II sewer project area is served by the water supply system. The sewer project included a significant portion of the water system service area. Much of the water system was constructed by developers in the 1950's and 1960's and utilized cement asbestos pipe. An outside contractor was retained to locate the water mains prior to construction of the sewers. The locations of the water mains were indicated on the contract drawings.

Project Design and Construction

The Phase I and Phase II projects were divided into 15 contracts. Contracts S-1 and S-8 were procurement contracts for the purchase of 925 grinder pumps. Environment One Corporation (E-One) was awarded the contract to provide the grinder pumps and associated equipment in the contract. The procurement contracts provided the benefit of a standardized grinder pump to be utilized throughout the Borough of Hopatcong system. E-One shipped the grinder pumps to the construction contractors for installation under the various contracts. The grinder pumps were utilized in low-pressure sewer systems of as many as 80 connections and also to pump individual homes on the low side of the street into gravity sewers. The roadways and sewers are as much as 27.432 meters (90 feet) above some lake front homes.

Contract S-2 was primarily a trunk sewer contract along the Musconetcong River and Flora Avenue that provided the means of connecting the Hopatcong collection system to the MSA facilities. Contract S-2 included the major crossing of the Musconetcong River and a 85.344 meters (280 foot) long tunnel under the railroad embankment.

Four pump stations were constructed under Contracts S-3, S-9 and S-12. The pump stations were constructed under these specialty contracts which separated the pump station mechanical type work from the pipe installation work. The pump installation contracts were sequenced beginning in the Southern areas of the Borough which is closest to the existing MSA interceptor system. Each pump station is equipped with odor exhaust gas control equipment and chemical feed equipment for wet well and force main odor control.

The Lakeside Pump Station was located in Modic Park as shown on figure 3 and the other three pump stations were located on parcels that were acquired. The Point Pleasant Pump Station and Center Pump Stations are in residential areas. The Cresent Cove Pump Station is located in the commercial area of the Borough and provisions have been made to increase the capacity to serve additional Borough neighborhoods to the north.

Figure 3 – Lakeside Pump Station-Modic Park

The collection system portion of the project was divided into nine contracts of $1,000,000 to $8,000,000 in size to promote bid competition and to provide for phasing of the construction from south to north.

Easement Acquisition

The Borough of Hopatcong acquired a total of 134 general easements which required a formal survey of the property easements and preparation of a deed description of easement from the property owner. Most of the 134 general easements also included the right to install a grinder pump on the property. The property surveys were conducted by Edward Secco Jr., PLS, under direct contract with the Borough. An additional eight hundred and sixty (860) "Deed of Easement Sewage System/Grinder Pump" agreements were entered which provided a perpetual easement to erect, construct, install, lay, use, operate, maintain, inspect, alter, clean, remove and replace the sewer pipes and grinder pumps. The Borough purchased three properties outright for pumping station sites. The Borough of Hopatcong attorney, Richard Stein, Esq., negotiated the greatest majority of the easements requiring formal condemnation proceedings on only a few parcels. Substantial assistance in the easement negotiations was provided by the Borough elected officials.

The Borough entered into 15 contracts with 8 different contractors for the Phase I and Phase II projects as indicated on Tables 3 and 4.

The Phase I construction of Contracts S-2, S-3, S-4 and S-5 began in March 2003. These southern most contracts provided conveyance capacity to the MSA facilities for the subsequent contracts to the north.

The Borough rejected the initial bids on Contract S-2 as the bid prices exceeded the Engineer's estimate. This contract was revised and rebid, favorable bids were then received and then awarded. The Phase I project final costs are indicated on Table 3.

Table 3 – Phase I Construction

Contract	Contract Number	Notice To Proceed	Contract Substantial Completion	Contractor	Construction Cost $
Grinder Pumps	S-1	06/11/03	11/30/06	E-One	714,724.00
Heights	S-2	03/03/03	05/31/05	Stacey	3,496,534.01
Pump Stations	S-3	03/03/03	12/31/04	Maple	1,281,308.66
Hills	S-4	03/03/03	08/30/06	Marbell	6,885,313.00
Point Pleasant	S-5	03/11/03	12/31/04	Metra	3,926,001.77
Lakeside	S-6	03/23/05	12/11/06	Stacey	1,230,018.05
Center	S-7	06/18/03	12/31/06	Metra	8,490,242.72
Subtotal Phase I					**$26,024,142.21**

As was anticipated by the project team, the greatest challenges of the project construction were the extensive sewer trench rock excavation, pavement maintenance and replacement, existing cement asbestos water mains, easement acquisition and grinder pump installation along the lakefront, maintenance of traffic access to the Borough during construction and contractor restoration of the individual properties.

Contract S-4, the Hills, was initially awarded on February 28, 2003, to Marbell, Inc.. The Borough found the contractor in default of the Contract on October 6, 2004, after their completion of approximately 80% of the bid work. The primary cause of the default was the inability of the contractor to excavate the rock from the pipe trenches in compliance with the specifications and the New Jersey Fire Marshall requirements. After the Borough found the contractor to be in default, the contractor declared bankruptcy. This complicated matters with the Bonding Company and delayed the Bonding Company and the Borough in completing legal arrangements to have the bonding Company takeover the contract and complete it. A takeover Agreement was executed between the Borough of Hopatcong and the bond company for the contractor on May 31, 2005. The bond company hired Metra Industries to complete Contract S-4 including approximately $1,000,000 worth of unfinished restoration work. The work on Contract S-4 resumed in June 2005 and was completed on August 30, 2006.

All Phase I contracts reached substantial completion by December 2006.

Lessons learned in the Phase I projects were applied to the Phase II projects through changes in the contract documents.

Phase II - Construction Contract Changes

1. NJDEP authorized a change to their standard definition of replacement pavement width to limit the construction quantities and cost.

2. Final pavement was not included in sewer contracts and was installed under the County Co-op Bid at substantially lower cost.

3. Changed the basis of payment for low-pressure sewer installation from unit price to lump sum, except for rock excavation to minimize restoration costs.

4. Several contractors complained that there were inadequate staging and spoil disposal sites. The Borough made staging areas available and spoil disposal sites available where recreation fields could be constructed.

The Phase II project approved by the Borough Council on February 20, 2002 consists of construction of sanitary gravity sewers, low-pressure sewers, pumping stations and force mains. The additional areas served by the Phase II contracts are Durban, Hopatcong Hills West, River Styx, the Carteret Road areas and Lakeside Boulevard North.

Table 4 – Phase II Construction

Contract	Contract Number	Notice To Proceed	Contract Substantial Completion	Contractor	Construction Cost $
Grinder Pumps	S-8	06/11/03	11/30/06	E-One	702,449.00
Cresent P.S.	S-9	08/05/03	03/31/06	P&H	2,519,778.18
Durban	S-10	07/21/04	10/31/07	Stacey	4,480,708.46
River Styx	S-11	08/19/04	12/31/06	Metra	3,771,859.24
Carteret P.S.	S-12	07/06/05	10/31/06	Navka	979,257.00
Lakeside North	S-13	03/08/07	11/30/07	P.M. Const	2,400,833.25
Hopatcong Hills	S-14 A	09/15/05	09/30/06	P.M. Const	2,477,193.71
Hopatcong Hills	S-14 B	10/11/05	11/30/06	P.M. Const	1,677,905.84
Subtotal Phase II					**$19,009,984.68**
Total Phase I & II					**$45,034,126.89**

Contract S-13 Lakeside Boulevard North, the final Phase II contract to be bid, is a large grinder pump system that serves lakefront homes. The bid notice to proceed for Contract S-13 was issued on March 8, 2007. The final construction cost is approximately $2,400,833.25. Substantial completion and activation of the system occurred in December 2007. The final paving of driveways, the last significant item of work for the project, will be completed in July of 2008. Authorization to provide service to all Phase I and Phase II customers was completed on December 4, 2007.

Analysis of Cost Control Measures

The construction cost of the Phase I and Phase II projects is broken down into categories on Table 5. An analysis of the key elements of the project follows.

Table 5-Phase I & Phase II Construction Cost Categories

Phase I and Phase II Sewer Systems Project	
Construction Cost Categories	
Four Pump Stations	$ 4,800,000
Pump Station Force Mains	$ 1,100,000
Trunk Sewers	$ 3,000,000
Grinder Pumps/Low-pressure Sewers (Private Property)	$ 7,400,000
Gravity and Low-pressure Collection System	$28,700,000
Total	$45,000,000

The Cost of Grinder Pump Installation

Grinder pump low-pressure sewer systems were utilized in areas along the lakefront with steep topograph and small lots, and in areas where the topography undulated and had shallow depth to bedrock.

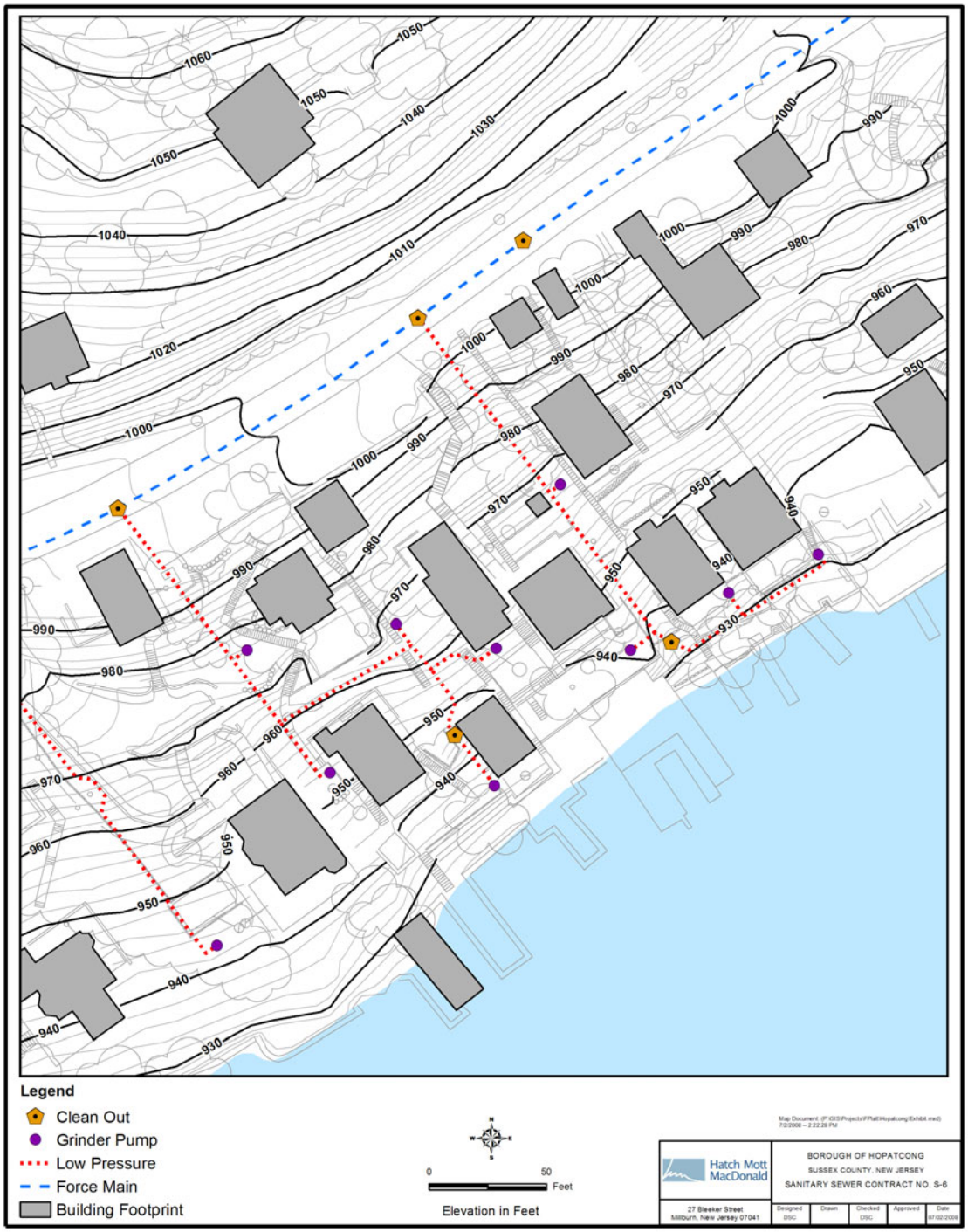

Table 4 – Typical Grinder Pump System

One of the most significant decisions made by the project team was for the Borough to purchase, install, own and operate the grinder pumps and low-pressure sewer connections on private properties. This decision required extensive system design, property surveys, deed preparation, easement negotiations/acquisitions and construction observation on private property. The cost for these services is estimated to be approximately four thousand ($4,000) dollars per parcel. The cost for the Borough to purchase the grinder pumps and to pay to have them installed is approximately $7,400,000 for approximately 920 parcels that are served by grinder pumps which results in a cost of approximately $8,000 per lot for construction.

Figure 5 – Grinder Pump Installation

Thus, the total cost to the project for the grinder pumps is estimated to be approximately $10,800,000 or $12,000 per parcel. The decision by the project team for the Borough to include this work on private property was based upon; 1) all users of the system having similar individual direct costs to be served; 2) to take advantage of lower interest rates for borrowing by the Borough and 3) to provide and install a single grinder pump system that had a history of satisfactory performance.

The homes on small lots and steep slopes along the lakefront could not have been served by a gravity sewer system. The installation of the low-pressure sewer system and the private property restoration were challenging, but was the proper choice.

Construction Change Orders

Contractor claims and change orders have been dealt with effectively by the project engineer, attorney, Borough staff and when appropriate, the Borough elected officials. The result of the effective negotiations is that there has not been any litigation between the Borough and the 8 contractors. All contract change orders have been reviewed and approved by the NJEIT.

A summary of the significant construction change orders is presented in Table 6.

Table 6 - Construction Change Orders

Sanitary Sewer Phase I and Phase II Project	
Construction Cost Summary **December 1, 2007**	
Sum of Bid Prices	**$41,300,000**
Summary of Significant Change Orders	
Phase I Pavement Replacement	$ 1,800,000
Negotiated Completion of Contract S-4	$ 1,400,000
Borough Requested Contract Changes	$ 700,000
Rock Excavation	$ -200,000
Water Main Repairs	$ 100,000
Other Overall Increases/Decreases	$ -100,000
Total Construction Cost	$45,000,000

There was a substantial overrun on the quantity of pavement replacement on the Phase I projects. NJDEP required HMM to modify the Phase I pavement specifications to eliminate a defined pavement width during the bid period. The width of pavement replacement in the municipal road which consisted extensively of built up oil and chips, exceeded the bid quantity because the existing pavement broke up beyond the trench under the loads of the construction equipment and trucks. The contractors had no incentive to limit the pavement disruption and necessary resurfacing under the NJDEP mandated payment method. Based upon the experience in the Phase I contract, a revised pavement specification was accepted by NJDEP for the Phase II projects that avoided additional overruns.

In several particularly difficult locations the trench rock excavation was less than 6 meters (20 feet) per day. In the Phase I contracts the unit cost in rock excavation was approximately $57 per cubic meter ($75 per cubic yard). As the contractors became more familiar with the difficulty of rock excavation the unit price for rock excavation in Phase II increased to $95 per cubic meter ($125 per cubic yard).

The contractor for Contract S-4 was found in default for failure to comply with the project schedule and abandoning the project. The Project Team negotiated a contract change order of approximately $1,400,000 with the Bond Company for completion of the project to avoid possible litigation, additional project delays and increased costs if rebid of the project was necessary.

The Borough requested four additional work items during the Phase I and Phase II projects at a total additional cost of approximately $700,000. The four additional work items were the revision of the Holiday Drive area from low-pressure sewers to gravity sewers, the change of the architectural stone facing on the Lakeside Boulevard Pump Station, the extension of the sewer on Hudson Avenue to serve additional lots, and the water main extension in Pickeral Point.

Rock excavation was a major project concern. An innovative approach of using ground penetrating radar was utilized in 1997 to determine the continuous rock profile in the streets. The ground penetrating radar was found to be helpful in determining the general rock location, but did not accurately identify the depth to rock in all locations. The rock excavation quantity exceeded the estimated quantity on some contracts and was under the estimate on others. The net result of all of the contracts was a minor under estimation of rock excavation which resulted in the final payment for rock excavation being $200,000 less than anticipated.

The homes on many streets are close to the road which limits the rock excavations methods. The small charge blasting was monitored closely by the New Jersey Fire Marshall. Demolition hammers were used in close proximity to existing utilities. More than 10,000 cubic meters of trench rock excavation was required.

Figure 6 – “The Rock”

Pressure testing of the gravity sewers and low-pressure sewer systems was conducted upon the completion of each contract. A mandatory sewer connection ordinance was adopted by the Borough in the Phase I and Phase II project areas. As sections of the sewer system were completed, the residents were provided 120 days to connect to the system. The collection sewer user fees of $875 per year were initially charged and development of the revenue stream as quickly as possible reduced the cost of interim project financing.

There were conflicts between the existing water system and sewer construction as anticipated. Water mains and service connections were broken in both Phase I and Phase II. The additional change order cost that was approved totaled approximately $100,000. In the project closeouts there was an under utilization of the contract quantities resulting in final closeout change orders having a net credit of $100,000.

The Engineering News Record construction cost index was 5471.16 in 1995 and was 8091.81 in December 2007. The index indicates that there has been a 48% increase in construction costs in the past 12 years since the planning of the sewer project began. Since the beginning of construction in 2003, the construction cost index has risen approximately 20%. The sequencing of the multiple contracts and the contract delays did cause an escalation of construction costs.

RESULTS

The construction of the Phase I and Phase II projects is complete. All pipelines and grinder pumps are installed, the pump stations are in operation and all connections authorized. The first connection to the sewer system was made in May 2004. Approximately 2,740 homes, businesses and public facilities are currently being served by the sewer system and the individual septic systems have been abandoned. The most densely populated residential areas in the southern portion of the Borough have been served as have the Lakeside Boulevard, Hopatchung Avenue, River Styx Road commercial areas.

The majority of the public facilities within the Borough have also been served including the Municipal Building, the Public Work Complex, the Civic Center, 2 of the 3 Borough firehouses, the High School, the Middle School, three elementary schools, four marinas, and one Community Beach Club. This has been accomplished by the dedicated efforts of the "Project Team" which includes the Borough of Hopatcong, Mayor, Council, staff and consultants with the support of the Borough residents.

A number of cost control measures were developed that addressed the following project constraints: 1) Protection of the lakefront, 2) Shallow depth to bedrock, 3) Steep slopes, 4) Small homes on small lots, 5) Modest income and fixed income residents. A number of project cost control measures were evaluated and implemented as summarized below.

The results of these measures are presented in Table 7. The achievement of cost savings is indicated by "Yes". If a cost savings was not achieved it is indicated by "No". A question mark "?" indicates that the results are not clear. The effect of the measures upon delay and claims is also indicated. The "Overall Benefit" of the measures is also indicated. Only the use of ground penetrating radar and the outside water main locator did not provide an overall benefit.
The average wastewater discharge rate per home has remained low, averaging less than 600 liters (140 gallons) per day per home.

The low discharge rate is attributed to the small size of the homes, conservative water use and limited leakage into the collection system with 30% low-pressure sewers which have performed very well.

Table 7 – Planning Cost Control Measures

Cost Control Measure	Resulted in Cost Savings	Caused Time Delay	Basis of Contractor Claims	Overall Benefit
Reduced Design Flow from 300 gpd to 200 gpd/home	Yes	No	No	Yes
Design utilized Low-pressure Sewers	Yes	Yes	Yes	Yes
Procurement Contract for Grinder Pumps	Yes	No	No	Yes
Borough install & maintain Grinder Pumps	?	Yes	No	Yes
Use Ground Penetrating Radar for Rock Profiles	?	No	Yes	?
Pre Design Location of Water Mains by Contractor	?	No	Yes	?
Tunnel Railroad Embankment	Yes	No	No	Yes
Divide Sewer Project into 15 Contracts	Yes	Yes	No	Yes
Conduct Value Engineering	Yes	No	No	Yes
Negotiate “Deed of Easement” for Grinder Pumps	Yes	Yes	No	Yes
Conduct Project Financial Planning	Yes	No	No	Yes
Conduct Public Participation	Yes	Yes	No	Yes
Modification of Phase II Contract Documents	Yes	No	No	Yes

The Phase I and Phase II projects eliminated approximately 45% of the non-conforming individual septic systems in the Borough, thereby substantially reducing sources of groundwater and surface water contamination. The reduction of the pollutant load, particularly phosphorus and nitrates, will improve water quality in Lake Hopatcong and the Musconetcong River. This will add significantly to the quality of life in the lakesheds.

Approximately 171.2 kilometers (107 miles) of pipe have been installed in the Phase I and Phase II contracts requiring the excavation of 80,278.3 cubic meters (105,000 cubic yards) of soil and 10,627.3 cubic meters (13,900 cubic yards) of rock.

CONCLUSIONS

The sanitary sewer project has been a thoughtful process since the planning began in 1995. Public input has been sought through referendum, a sewer advisory committee, open public planning meetings, public hearings, council meetings and neighborhood meetings.

The question has consistently been asked by the elected officials and project team during the planning and construction. "Is there a better and more cost effective way to undertake the project?" It has been a team effort led by Mayor Richard H. Hodson and supported by the Borough Council, Federal and State Legislators, the Borough Staff, the Attorney, Auditor, Bond Council, Surveyor and the Engineer.

The Phase I and Phase II projects construction began in April 2003 and was completed July 2008, five years. That is a long time for a municipality, elected officials, staff and residents to deal with construction activities.

What has been achieved in the Borough of Hopatcong?

1. Approximately 7,000 Borough residents, 2,740 homes, the Borough's commercial center and the majority of the public facilities located within the 4.9 square kilometers (1.9 square miles) most densely populated portion of the municipality are now serviced by sanitary sewers.
2. The groundwater in the Phase I and Phase II sewer service area, which is the source of potable water for both the public and private wells, no longer receives discharge from the septic systems.
3. Septic systems have been eliminated from 6.9 kilometers (4.3 miles) of Lake Hopatcong shoreline.
4. Routine testing of the Borough's wells has already revealed an improvement in ground water quality, particularly as it relates to nitrates. Hopatcong residents dependent on wells are enjoying better ground water already as a result of the sewer project.

This tremendous accomplishment benefits not only the residents of Hopatcong, but the entire Lake Hopatcong community and significant areas of New Jersey, Pennsylvania and Delaware. Lake Hopatcong is the headwaters of the Musconetcong River which received a federal designation as a "Wild and Scenic River" in 2006. The Musconetcong River is a tributary of the Delaware River upstream of the City of Trenton and City of Philadelphia water supply intakes. This project has provided regional benefits.