Chapter 18C: Ambrey Pond Reservoir Alternative

18C.1. INTRODUCTION

In accordance with the State Environmental Quality Review Act (SEQRA), Chapter 18 of this Draft Environmental Impact Statement (DEIS) presents and analyzes alternatives to the Proposed Project. The analysis of alternatives in this DEIS is presented in four parts that, together with an introduction, make up Chapter 18:

- Chapter 18A, which analyzes process and operational alternatives to the Proposed Project (other than the Ambrey Pond Reservoir Alternative and the Wastewater Reuse Alternative);
- Chapter 18B, which evaluates design alternatives for the Proposed Project;
- Chapter 18C (this chapter), which assesses the Ambrey Pond Reservoir Alternative; and
- Chapter 18D, which assesses the Wastewater Reuse Alternative.

To comply with SEQRA, environmental impact statements (EISs) must include an evaluation of alternatives that seeks to identify "reasonable alternatives available." As set forth in the SEQRA regulations, EISs must include "a description and evaluation of the range of reasonable alternatives to the action that are feasible, considering the objectives and capabilities of the project sponsor."[1] The SEQRA regulations call for analysis of a No Action Alternative—in which the Proposed Project is not implemented—as well as a range of alternatives, that "may also include, as appropriate, alternative: (a) sites; (b) technology; (c) scale or magnitude; (d) design; (e) timing; (f) use; and (g) types of action."[2]

This chapter presents and analyzes an alternative to the Proposed Project involving the creation of a surface water reservoir in the Town of Stony Point. Under SEQRA, alternatives selected for consideration are generally those within the capabilities of the project sponsor that have the potential to reduce, eliminate, or avoid significant adverse impacts of a proposed action while meeting the purpose and need for and benefits of the action, which in this analysis are described in Chapter 1, "Purpose and Need." As discussed below, construction of this reservoir as a future potable water supply source has long been under consideration.

Following this introduction, this chapter of the DEIS includes the following sections:

Section 18C.2: Background of the Ambrey Pond Reservoir Alternative.

Section 18C.3: Description of the Ambrey Pond Reservoir Alternative.

Section 18C.4: Ambrey Pond Reservoir Alternative's Ability to Meet the Purpose and Need of the Proposed Project.

Section 18C.5: Effects of the Ambrey Pond Reservoir Alternative.

---

[1] 6 NYCRR § 617.9(b)(5)(v).

[2] Ibid.

Section 18C.6: Effects of the Ambrey Pond Reservoir Alternative in Comparison to Those of the Proposed Project.

18C.2. BACKGROUND OF THE AMBREY POND RESERVOIR ALTERNATIVE

As early as the 1960s, the Spring Valley Water Company, the predecessor to United Water New York Inc. (United Water), identified the need for a new source of drinking water to meet the projected demand anticipated in Rockland County. At that time, development of a conventional surface water reservoir was thought to be the most reasonable approach to meeting this projected demand. The candidate location for the new reservoir was to be the site of the existing Lower and Upper Ambrey Ponds, in the Timp Mountain watershed, in the Town of Stony Point. Lower Ambrey Pond was formed by an existing small stone dam with a pond elevation of approximately 261 feet, and an existing storage capacity of approximately three million gallons. The upstream Upper Ambrey Pond was an unimpounded water body with a pool capacity of approximately seven million gallons. The new reservoir at this site would be created by a new dam located directly downstream of the existing Lower Ambrey Pond dam designed to capture the runoff from Timp Mountain Brook. This new water supply impoundment was to be called the Ambrey Pond Reservoir.

Plans for an Ambrey Pond Reservoir proceeded and evolved over a period of 40 years in response to refinements of water demand projections due to population growth and the commencement of water conservation initiatives.

The initial reservoir concepts of 1968 responded to a projected need for an additional 6.0 million gallons per day (mgd) by 1985, and system improvements were able to provide an estimated 1 mgd toward that amount. To cover the projected 1985 shortfall of 5.0 mgd, plans were advanced for an Ambrey Pond Reservoir with a pool elevation of 285 feet, and a storage capacity of about 780 million gallons. Analyses indicated that Timp Mountain Brook's 3.2 square mile watershed did not provide sufficient stream flow volume to support the reservoir's requirement of a 5 mgd safe yield.[1] As a result, the initial ideas, as well as all subsequent Ambrey Pond Reservoir concepts, included a diversion of water from the nearby Tiorati Brook, with a catchment area comprising about 9 square miles located largely within Harriman State Park.

In the late 1970s, the initial reservoir concepts that contemplated a dam and reservoir pool height that could be raised over time to increase reservoir storage capacity in response to increased water demands were updated. The initial phase of the revised plan called for a slightly higher dam and a greater storage capacity that was estimated to provide a safe yield of 7.6 mgd, rather than the 5 mgd of the earlier concept. The reservoir spillway and pool elevation was raised from 285 feet to 316 feet, creating a larger reservoir storage capacity of 1,970 million gallons (rounded in this analysis to 2 billion gallons). Once constructed, the reservoir storage capacity would remain constant (e.g., no further increases in dam height or pool area), and additions of supplemental water sources would be constructed as water demands increased, expanding the reservoir's initial safe yield of 7.6 mgd to 9.5 mgd, and ultimately to 12.5 mgd. The first such supplemental water source would be pumped from an expanded Cedar Pond Brook

[1] As discussed in Chapter 1, "Purpose and Need," section 1.3.1.1, safe yield is defined as the amount of water that could reasonably be provided during a repetition of the "drought of record." The drought of record is the drought that had the worst effect on availability of water from the water source, which could be a single year's drought or a combination of several drought years.

impoundment, and the second source would be water diverted and transmitted from Minisceongo Creek.

This reservoir configuration formed the basis of a DEIS that was prepared in 1979 to assess the potential impacts of the Ambrey Pond Reservoir project.[1] In 1987 the New York State Department of Environmental Conservation (NYSDEC) conditionally approved the water supply application of the Spring Valley Water Company Inc., the predecessor to United Water, for the Ambrey Pond Reservoir, and determined that the obligations of SEQRA had been met.[2]

At the time, this project was opposed by numerous parties, including Rockland County, the Town of Stony Point, and numerous other non-governmental organizations. The reasons cited for opposition included the need for the project, its impact on fisheries, wetlands and marshes, the "trigger" mechanism in the decision that would activate the conditional approval, as well as concerns about potential seismic risks associated with constructing a dam in close proximity to the Ramapo Fault. The NYSDEC Commissioner's conditional approval of the project was challenged in court and ultimately upheld on appeal by the Supreme Court of New York, in 1988.[3]

During this period, United Water continued to plan for the Ambrey Pond Reservoir project as its long-term water supply project, and over the years it acquired nearly all the land that would be necessary to construct the reservoir. Currently, United Water owns 31 parcels comprising approximately 319 acres of land in connection with the project.

Concurrent with its preparation for an Ambrey Pond Reservoir, United Water continued to make efficiency improvements to its existing water supply system that enabled it to meet short-term demands. These improvements are discussed in Chapter 1, "Purpose and Need," and are also discussed as part of the Short-Term Water Supply program under the No Action Alternative in Chapter 18A, "Process and Operational Alternatives." Additional water supply system improvements also included a discussion of major projects, such as flow augmentation initiatives for the Ramapo River that improved operations of the Ramapo Valley Well Field.

In addition to system improvements, in the early 1990s, United Water initiated an aggressive water conservation program to encourage water conservation by its customers. Also, during this period, water conservation requirements were included in newly revised building and plumbing codes that were adopted by state and municipal government. These new regulatory codes required that all new construction and renovations use water-saving fixtures and employ other water conservation techniques.

The combination of system improvements and efficiencies and water conservation programs and regulations contributed to reductions in projected water demand, enabling United Water to defer implementation of a new long-term water supply project. However, continued planning to meet

---

1 Draft Environmental Impact Statement for the Ambrey Project consisting of enlargement of the existing Ambrey Pond reservoir, construction of a water treatment plant, and diversion works in the Town of Stony Point, Rockland County, New York. Lead Agency: NYSDEC, May 1979.

2 In the Matter of the Applications of the Spring Valley Water Company, Inc. (Ambrey Pond Project) for permits to construct a reservoir, diversion pipelines and a water treatment plant, all known as the Ambrey Pond Project in the Town of Stony Point, Rockland County, DEC Project No. 334-06-0059 Water Supply Application No. 6971, New York Department of Environmental Conservation, January 6, 1987, Decided, Final Decision of the Commissioner.

3 See Hudson River Fisherman's Ass'n. v. Williams, 139 A.D.2d 234 (3rd Dep't 1988).

long-term water supply needs beyond the capacity of the existing water supply system remained a United Water priority because population projections indicated a continuing upward trend into the future.

Taking into account the system improvements and water conservation initiatives, United Water determined that while the need for a long-term water supply project remains, a project the size of the Ambrey Pond Reservoir analyzed in the 1979 DEIS is not needed. The January 2007 submission to the New York State Public Service Commission (PSC) describing the long-term water supply alternatives under consideration[1] described a smaller Ambrey Pond Reservoir than the project initially evaluated in the 1979 DEIS and 1987 Final Decision by NYSDEC. The January 2007 submission noted that a 2 billion gallon reservoir would not be necessary to meet United Water's long-term needs and a smaller reservoir (600 million gallons) would meet the need. However, further analysis following the 2007 submission to the PSC has demonstrated that a reservoir of this size would not provide the 7.5 million gallons per day (mgd) of safe yield that is needed. Therefore, this DEIS considers a modified Ambrey Pond Reservoir project with a 2 billion-gallon reservoir like that included in the 1979 DEIS, but without the additional water supply elements that were to be added in future phases for that project. This Ambrey Pond Reservoir Alternative therefore incorporates the elements that were included in Phase 1 of the project analyzed in the 1979 DEIS.

As discussed in Chapter 1, "Purpose and Need," the need for a long-term water supply project remains. Yet in the intervening years United Water has reconsidered the Ambrey Pond Reservoir due to concerns regarding its drought tolerance, expandability, complexity of construction, and anticipated cost. In combination with the history of opposition to Ambrey Pond Reservoir, the passage of time since initial approvals had been given, and technological advances in water supply systems, these factors have lead United Water to conclude that the Proposed Project is a more reliable and more financially and environmentally prudent means of meeting long-term water supply demands than the Ambrey Pond Reservoir project. This DEIS evaluates the Proposed Project, and considers the Ambrey Pond Reservoir (and other alternative projects) as an alternative to it.

18C.3. DESCRIPTION OF THE AMBREY POND RESERVOIR ALTERNATIVE

Under the Ambrey Pond Reservoir Alternative evaluated in this DEIS, United Water would develop a long-term water supply consisting of a surface water storage reservoir similar to that described in the 1979 DEIS. The Ambrey Pond Reservoir Alternative would consist of a reservoir created by the construction of a main and an auxiliary dam having a water storage capacity of 2 billion gallons, a diversion dam and raw water main to convey raw water from a Tiorati Brook impoundment to the reservoir, and a water treatment plant located below and between the main and auxiliary reservoir dams, all within the Town of Stony Point. The Ambrey Pond Reservoir project described in this analysis would be constructed in three phases (similar to the 1979 DEIS analysis), and upon completion, would provide a safe yield production capacity of approximately 7.5 mgd.

Figure 18C-1 shows the general location of the Ambrey Pond Reservoir Alternative in the Town of Stony Point.

[1] Prepared in compliance with Commission Order in Case No. 06-W-0131 Issued and Effective December 14, 2006 by the PSC.

The Ambrey Pond Reservoir Alternative would be implemented in phases to keep pace with increasing water demands. Initially, the reservoir would have a safe yield of 3.1 mgd, and the water treatment facilities would have a production capacity of 2.5 mgd. The safe yield of the reservoir would be increased, as needed, in the second phase, bringing it from its initial 3.1 mgd to 7.9 mgd in response to water demands based on population projections. The production capacity of the water treatment plant would be increased in 2.5 mgd increments to eventually provide a maximum production capacity of 7.5 mgd by the third phase.

For purposes of this analysis, the effects of the final phase (project build-out) of the reservoir and water treatment plant development are considered. This would include all proposed diversions in place, and a water treatment plant capable of delivering 7.5 mgd of potable water.

It is important to note that as with many major infrastructure or public works projects of this magnitude, the preparation of detailed engineering and construction plans is preceded by years of conceptual planning and preliminary engineering studies and analyses. The investment in detailed engineering and construction designs often does not occur until immediately before construction so as to reflect the latest design requirements and standards, and to minimize public and ratepayer expenditures until feasibility is known, and regulatory authorizations are assured. Although the Ambrey Pond Reservoir has long been under consideration as a long-term water supply source, detailed engineering designs and construction drawings have not yet been prepared. The level of planning detail for the Ambrey Pond Reservoir, however, enables an accurate assessment of its potential environmental impacts, and provides a basis for comparison to the Proposed Project and its other alternatives, as presented in Chapters 18A and 18B, "Process and Operational Alternatives," and "Project Design Alternatives," respectively.

18C.3.1. AMBREY POND RESERVOIR DEVELOPMENT PHASES

18C.3.1.1. PHASE 1

During this phase, the two dams necessary to create the Ambrey Pond Reservoir would be constructed, along with all necessary site work and roadway relocations. A new water treatment plant would be constructed at the site of the auxiliary dam at the reservoir site. The water treatment plant would have an initial potable water production capacity of 2.5 mgd. The locations of these components are shown on **Figure 18C-2**.

Acquisition of any remaining land needed to construct the Ambrey Pond Reservoir would occur during this initial phase.

18C.3.1.1.1. Create Ambrey Pond Reservoir

The Ambrey Pond Reservoir would be located at the site of two existing ponds, Lower Ambrey Pond and Upper Ambrey Pond, within the lower reaches of the Timp Mountain Brook watershed, a tributary to Cedar Pond Brook. The reservoir site is located in an area characterized by low-density residential development, recreation and open space lands, and forested areas, and is roughly bounded by Cedar Flats Road to the west and Bulsontown Road to the east. As noted above, United Water (and its predecessor, the Spring Valley Water Company) has acquired nearly all the parcels required for the reservoir, and at the present time owns in fee 31 parcels, comprising approximately 319 acres.

The reservoir would be created by the construction of a concrete main dam and an earth-fill auxiliary dam, with a spillway and reservoir pool elevation of 316 feet. The new main dam would be approximately 72 feet in height, and approximately 480 feet long, and it would be located immediately downstream of the site of the existing Ambrey Pond dam. The auxiliary

dam would be approximately 53 feet high, and 900 feet in length. The reservoir would have a total storage capacity of 1,970 million gallons (rounded to 2 billion gallons in this analysis), with a usable volume of 1,720 million gallons, which represents the point below which further safe yield draw-down would not occur. Phase 1 of the reservoir would be designed to capture runoff from the 3.2 square mile Timp Mountain Brook watershed in which the reservoir is situated. With this primary water supply source, Phase 1 of Ambrey Pond Reservoir would support a safe yield of 3.1 mgd.

The creation of Ambrey Pond Reservoir would require that additional land acquisitions be made by United Water, as well as the relocation of sections of Cedar Flats and Bulsontown Roads.

18C.3.1.1.2. Water Treatment Plant – Phase 1

In addition to the Ambrey Pond Reservoir, the other major component of Phase 1 would consist of a new water treatment plant located at a location between the main and auxiliary dams. The treatment plant would have a clear well floor line approximately 15 feet higher than the crest of the dams, at approximately elevation 334 feet. The topography of the site would necessitate shelving to provide an adequate site for the plant at this elevation. The location of the plant is shown on Figure 18C-2. A 36-inch diameter raw water transmission main would run from a low-lift pumping station at the main dam to the water treatment plant.

During Phase 1, the water treatment plant would be sized to have a production capacity of 2.5 mgd, and would employ conventional water treatment processing technology, including pretreatment (flocculation and sedimentation), microfiltration/ultrafiltration, granular activated carbon filtration, and chlorination.

Two finished water mains from the water treatment plant would tie into the existing United Water distribution system. One main, 16 inches in diameter and about 3,400 feet long, would connect with the Crickettown Heights service area, and another 30-inch main approximately 9,000 feet long would connect with the existing distribution system in the vicinity of Goetschius Court. The finished water mains would be sized to accommodate the maximum design water treatment production capacity of 7.5 mgd. As noted above, the treatment plant elevation of approximately 334 feet would be expected to provide gravity service to the existing water distribution system.

18C.3.1.2. PHASE 2

As additional production capacity is needed, an additional reservoir water source would be developed to increase the safe yield of Ambrey Pond Reservoir to 7.9 mgd, and additional treatment equipment would be installed in the water treatment plant to increase its finished water production capacity to 5 mgd.

18C.3.1.2.1. Tiorati Brook Diversion

As water demands increase, Phase 2 of the Ambrey Pond Reservoir project would be implemented. The primary component of this phase is the addition of a second water supply source to the Ambrey Pond Reservoir to supplement the 3.2-square-mile catchment area of Phase 1. This would involve the diversion of water from the nearby Tiorati Brook, a stream originating at Lake Tiorati in the Palisades Interstate Park. This diversion would contribute a watershed area of approximately 9 square miles to the reservoir's water supply. The addition of this diversion would result in a combined reservoir catchment area of 12.2 square miles, enabling Ambrey Pond Reservoir to support a safe yield of an estimated 7.9 mgd of potable water during periods of peak demand. Under the 1979 DEIS, this diversion was considered to be

part of the initial phase of the project. A phased approach to meeting the safe yield is considered under this Ambrey Pond Reservoir Alternative.

The Tiorati Brook diversion impoundment would be created by construction of an earthen dam on the lower reach of Tiorati Brook, above its confluence with Timp Mountain Brook. The impoundment would have a spillway and pool elevation of approximately 350 feet.

The Tiorati Brook impoundment would be located within the median of the Palisades Interstate parkway, between the northbound and southbound lanes. Water diverted from this impoundment would be transmitted through a 30-inch diversion raw water transmission main under the northbound lane of the Parkway, and be transmitted by gravity approximately 4,300 feet to the Ambrey Pond Reservoir. The diversion main would be installed in the public right-of-way of the Palisades Interstate Parkway, run under the northbound lane of the Parkway, and continue to the reservoir along the rights-of-way of Cedar Pond and Cedar Flats Roads, terminating in an outlet structure at the Ambrey Pond Reservoir's auxiliary dam.

18C.3.1.2.2. Water Treatment Plant – Phase 2

With the increase of the Ambrey Pond Reservoir safe yield from 3.1 mgd to 7.9 mgd through the addition of the Phase 2 Tiorati Brook diversion, the water treatment plant production capacity would be expanded by installing additional treatment equipment to increase its potable water production capacity from 2.5 mgd to 5 mgd.

18C.3.1.3. PHASE 3

Phase 3 would consist of expanding the water treatment plant water production capacity from 5 mgd to 7.5 mgd. This expansion in treatment capacity would be expected to involve the installation of additional equipment within the existing treatment plant facility. No additional impoundment or diversion would be required to implement this phase.

18C.3.2. LAND ACQUISITION

18C.3.2.1. LAND ACQUISITION REQUIREMENTS

The Ambrey Pond Reservoir Alternative would require a 459-acre site to accommodate the reservoir, its impoundment structures, the water treatment facility and related infrastructure, roadway relocations, and buffer lands (see **Figure 18C-3**). To date, United Water has acquired most of the land needed for this alternative, including 34 individual properties totaling 319 acres. To undertake this alternative, an additional 140 acres would need to be acquired.

Land acquisitions are expected to include the non-United Water properties that would be fully or partially inundated by reservoir construction. In addition, acquisitions would be necessary for roadway relocations, as more fully discussed in section 18C.3.3, below, and to accommodate other necessary reservoir improvements, such as dam and spillway construction, and other related uses. The primary acquisition area is roughly defined by the lands lying between the relocated Bulsontown and Cedar Flats Roads and the reservoir pool, as well as those areas beyond these roads that would be directly affected by the reservoir.

Acquisitions are expected to include the purchase of entire parcels, as well as partial acquisitions of portions of larger parcels due to individual parcel use, size, and configuration, and the extent to which it is needed for reservoir purposes. In addition, as further discussed below, the acquisition of easements is expected to be an appropriate means of gaining access or passage for some aspects of the Ambrey Pond Reservoir project. Local land use regulatory controls are also an important consideration for United Water's ultimate reservoir protection acquisition program.

Of the necessary approximately 140 acres needed to be acquired, United Water anticipates the outright acquisition of 16 parcels that would be completely or partially flooded by the reservoir. These acquisitions comprise approximately 47 acres, and several of these parcels are currently in residential use. An estimated 13 residential uses would be displaced by these acquisitions.

In addition to purchases of entire parcels, United Water anticipates acquiring portions of several larger parcels. Such partial acquisitions are anticipated to affect three larger parcels that are currently owned by Duke Energy, the Rockland County Girl Scout Council (Camp Addison Boyce), and the Rockland County Boy Scouts Council. It is estimated these partial acquisitions would entail land division and transfer of approximately 95 acres of land to United Water. Acquisitions from the Scout Council properties would be configured to minimize any adverse effects on recreational uses of the affected properties.

For the purposes of this analysis, United Water does not anticipate the need to acquire all properties within the Town of Stony Point's Ambrey Pond Reservoir Protection District,[1] particularly properties that lie to the east and west of Bulsontown and Cedar Flats Roads. The district was created by the town to protect water quality within 500 feet of the perimeter of the proposed Ambrey Pond Reservoir, as shown on **Figure 18C-4**. The district regulations provide standards to limit development within the protective perimeter to the maximum extent practicable. The district further provides a regulatory mechanism to review the introduction, expansion or alteration of existing or proposed uses, buildings or structures in order to ensure that development is designed in a manner that protects water quality of the Ambrey Pond Reservoir. Land within the buffer area would be considered for acquisition by United Water; however, the extent and means of acquisition by United Water would be determined on a parcel-by-parcel basis.

In addition to fee acquisitions, United Water anticipates the need to obtain easements for various reservoir purposes. United Water anticipates the need for easement acquisitions from the Palisades Interstate Park Commission for the establishment of the Tiorati Brook diversion impoundment, which would be located on Palisades Interstate Parkway land, as well as the raw water transmission main carrying diverted Tiorati Brook water to Cedar Flats and Cedar Brook Roads, where additional water transmission main easements would be required for pipeline installation. Similarly, additional roadway easement acquisitions may be required from the Town of Stony Point and Rockland County for the raw water transmission main from the reservoir to the water filtration plant. Roadway easements may also be required to connect finished water mains to the existing water distribution system.

18C.3.2.2. ESTIMATED ACQUISITION COST

As discussed above, United Water anticipates that the necessary acquisitions would occur in arm's length transactions at fair market value on an as-needed basis. However the ultimate means and nature of individual acquisitions, as well as the configurations of partial parcel purchases, will be determined on a parcel-by-parcel basis. For this analysis, however, it is assumed that United Water would acquire the properties as shown on Figure 18C-3 at fair market value.

To determine the potential acquisition expense involved in the fee acquisitions of the subject properties, the Town of Stony Point tax records for the 2009-2010 year were reviewed, and the

[1] Section 215-91 of the Town of Stony Point Town Code.

town's most recent fair market value assessments were obtained.[1] In addition, the individual tax bills for the Ambrey Pond Reservoir lands owned by United Water were reviewed. The fair market value assessments are intended to represent the town's full-value appraisal of the individual parcels. According to Town of Stony Point records, the total fair market value of the affected parcels, including the Duke Energy and the nonprofit-owned Scout and St. James Bible Church lands, is listed as $128 million.

For acquisition analysis purposes, this analysis calculates an average fair market value of the acquisition parcels on a per-acre basis, including improvements and structures, and applies that valuation to the total number of acres expected to be acquired for the reservoir to arrive at an estimated gross acquisition cost. The estimation excluded the nonprofit Scout and St. James Bible Church properties on the basis that town's fair market values of these properties reflect their tax-exempt status, and the value appeared to be set artificially low. Town records indicated a fair market value of $21,860 per acre for the Scout properties, and a $1,647 per acre for the St. James Bible Church property. In addition, the Duke Energy parcel was not included in the calculation due to a calculated valuation of $4.1 million per acre, which reflects utility usage of this parcel.

Calculated as described above, based on the Town of Stony Point's 2009–2010 assessment rolls, the average cost of the lands anticipated for acquisition is estimated to be $45,953 per acre. This amount was arrived at by dividing the fair market value of the privately owned parcels by their gross acreage. This average valuation takes into consideration variation among the subject acquisition parcels, and the fact that some parcels are developed as residential properties with houses and accessory improvements, and others are undeveloped forest, and in some cases, wetland properties. Thus, the average should not be construed to represent a value that can be applied to any particular parcel, but rather as an aggregate value representing an estimated per-acre acquisition cost spread across all lands needing to be purchased.

As noted above, an additional 140 acres of land is estimated to be needed for the creation of Ambrey Pond Reservoir. At an approximate value of $45,953 per acre, the total land acquisition cost for the remaining Ambrey Pond Reservoir acreage is estimated for the purposes of this analysis to be in the vicinity of $6.4 million. The actual amount, of course, would be determined between United Water and the individual property owners at the time land acquisition proceedings are initiated.

18C.3.2.3. EASEMENT ACQUISITION NEEDS

In addition to outright fee acquisitions of land, it is expected that United Water would also obtain easements for the creation of Ambrey Pond Reservoir. As discussed more fully in section 18C.3.3 below, the creation of Ambrey Pond Reservoir would inundate segments of existing public roadways. The roadway easements and any utility easements along the road rights-of-way would need to be obtained by United Water. The land acquisitions discussed above are expected to provide for replacement rights-of-way for relocated roadway and utility corridors. In addition, the construction of the reservoir would inundate a segment of utility easement held by Orange and Rockland Utilities, Inc. in the vicinity of the main dam. The inundated segment of this easement would have to be obtained, and rerouting of the utility easement would be necessary.

Utility easements along the rights-of-way along Town of Stony Point and affected Rockland County roads would be required for construction of the potable water transmission main routes

[1] Town of Stony Point, Office of the Assessor, visited July 2010.

transmitting water from the water treatment plant to the existing water distribution system, and to carry water from the Tiorati Brook impoundment to the main reservoir site.

The Tiorati Brook impoundment and segments of its water transmission route would require the acquisition of construction and utility easements from the Palisades Interstate Park Commission. These acquisitions would likely involve the alienation of dedicated public parkland, and would therefore require New York State's legislative authorization. In addition, it is anticipated that Tiorati Brook diversion water transmission main easements may affect Harriman State Park, a facility that has received federal funds through the Land and Water Conservation Fund. Section 6(f) of the Land and Water Conservation Fund Act of 1965 stipulates that parkland conversion procedures be undertaken when parkland benefitting from these funds is converted to a non-park use. The National Park Service oversees the conversion process, and, among other things, requires that substitute lands be provided that are of at least equal fair market value, and that these lands offer reasonably equivalent recreational opportunities. No recreational use is known to occur on the potentially affected park lands.

18C.3.3. ROAD RELOCATIONS

The Ambrey Pond Reservoir Alternative is bordered on the west and east side by Cedar Flats and Bulsontown Roads, respectively. Cedar Flats Road intersects with Queensboro Road which intersects with Mott Farm and Bulsontown Roads just to the east of Cedar Flats Road. These roads are Rockland County routes and generally carry 24-foot wide paved surfaces with one travel lane in each direction. There are no shoulders, guide rails, or structured drainage. The majority of traffic utilizes Cedar Flats Road connecting to Mott Farm Road.

Creation of the Ambrey Pond Reservoir will inundate sections of existing roadways, including segments of Bulsontown Road, Cedar Flats Road, Queensboro Road, and Mott Farm Road. Based on the elevation and shoreline of the reservoir, the inundation would include about a half mile of Cedar Flats Road and Mott Farm Road, one mile of Bulsontown Road, and a short segment of Queensboro Road between Cedar Flats and Mott Farm Roads.

The inundation of these roadway segments would require that the roadways be reconstructed on new alignments located upland of the Ambrey Pond Reservoir before tying back to the existing roads. It is assumed that roads would be relocated to higher ground adjacent to the new reservoir and that Mott Farm Road would be realigned to meet directly with Cedar Flats Road at its current intersection with Queensboro Road. Connecting Queensboro Road to the relocated Bulsontown Road via a bridge could be evaluated as an alternative to Queensboro Road's relocation. New road sections will likely be constructed in a side hill cut and fill fashion with most of the work consisting of rock excavation.

The land acquisitions discussed above are expected to take into consideration the need for new alignment rights-of-way as roadway relocations may require. The realignment of the southerly segment of Cedar Flats Road, however, may require right-of-way access through land owned by the Palisades Interstate Park Commission. The exact location and construction details of roadway realignments would be developed should the Ambrey Pond Reservoir Alternative be considered for implementation.

The roadway realignment would not be expected to have long-term effects on traffic patterns and short term disruptions would likely be minor and limited in duration as new roadway alignments would be constructed prior to closure of the existing roads. Some temporary diversions of traffic could occur on adjacent north-south routes such as Wayne Avenue and Buckberg Road.

18C.3.4. AMBREY POND RESERVOIR CONSTRUCTION

The creation of the Ambrey Pond Reservoir would require an extensive and large-scale construction effort associated with developing three dam structures (e.g., the main, auxiliary, and Tiorati diversion dams), approximately 14,200 linear feet of new potable water transmission mains, a water treatment plant and pumping facilities, and roadway construction. In addition, the preparation of the impounded areas would require extensive clearing, grading, building demolition, and road and infrastructure removal. This section discusses how those facilities are expected to be constructed; the analysis of the effects of their construction is presented in sections that follow.

As discussed earlier, detailed engineering designs and construction plans have not been prepared. However, conceptual plans based on preliminary geotechnical studies have been developed over time, reflecting the evolution of the reservoir's size and water supply configurations. Absent detailed engineering analyses and construction designs, this analysis presents a most-likely case scenario of how the construction of the Ambrey Pond Reservoir is anticipated to occur.

The description of anticipated dam construction activities reflects previous engineering studies and analyses, and reflects accepted and generalized reservoir impoundment processes based on construction practice according to the U.S. Army Corps of Engineers (USACE) design manuals (e.g., EM 1110-2-2200 *Gravity Dam Design* and EM 1110-2-2300 *General Design and Construction Considerations for Earth and Rock-Filled Dams*). While the ultimate design and assessment of construction for a dam is considerably more detailed, a general overview of the construction process and its effects are discussed below.

18C.3.4.1. CONSTRUCTION OF THE DAMS

Construction of the three dam structures necessary to create the main reservoir and the diversion impoundment will be the most time and materials-intensive aspect of creating the Ambrey Pond Reservoir. There are three basic types of dam: gravity dams of concrete; gravity dams of earth or rock fill; and arch dams. Each type has specific applicability based on the intended dimensions of the dam, the topographic features of the site, and the underlying structural/geological suitability of the site. Based on engineering analyses conducted prior to and for the 1979 Ambrey Pond Reservoir DEIS, the main reservoir would be constructed with a concrete gravity dam for the main facility, and an earth-filled dam for the auxiliary dam. It is expected that the Tiorati Brook diversion dam would also be of the earth-filled type.

Gravity dams essentially use a wedge-shaped design that is wider at the base and narrow at the top, in which the downward pressure of water against the dam reinforces the load-bearing character of the structure. Concrete dams can be constructed with two basic techniques of conventional concrete and roller-compacted concrete. Conventional concrete involves the mixing of sand, aggregate, cement, and water in batches that are then poured and formed on-site. Roller-compacted concrete (RCC) uses a drier mix of materials that are mixed and compacted in-place through vibration and compression which is sufficient to bind the materials and create the hardened structure. In RCC construction, the concrete is placed by dump trucks or conveyors, then spread and compacted in lifts by conventional earth moving equipment to create the dam.

Based on anticipated dam crest length, load-bearing requirements and seismic demands for the Ambrey Pond Reservoir, it is anticipated that RCC dam construction would be employed for the approximately 480-foot long main dam structure. The top elevation of the dam would be at

approximately 325 feet. An intake structure and low lift pumping station would be incorporated into the center of the dam. Two 50-foot spillway sections, one on each side of the pumping station, would be constructed with crest elevation of 310 feet. Bascule gates would raise the pool elevation to a maximum of 316 feet. A 12-foot-wide access road with two bridge sections over the spillways would be constructed over the top of the dam.

Based on a crest length estimated to be 900 feet in width, and the anticipated availability of suitable on-site fill material, it is anticipated that the auxiliary dam would be constructed as an earth dam with crest elevation of 325 feet. Earth dams consist of processed soil fill that is placed and compacted in a controlled manner. To limit seepage, the earth dam would likely require a low-permeability core, consisting of processed on-site fill mixed with bentonite. In addition, the earth dam would also require an internal filtered drainage blanket and toe drain to control any residual seepage through the dam. No inlet structure or spillway is proposed for the auxiliary dam. The Tiorati Brook impoundment structure is also expected to be an earth-filled dam.

Both earth and RCC-type dams would be designed to meet current dam codes and standards, including seismic considerations.

18C.3.4.1.1. Seismic and Geological Analysis

The location, sizing, and type of dam require careful assessment of the underlying geology and seismic activity. Preliminary studies were undertaken during the development and evolution of the Ambrey Pond Reservoir plans. Studies conducted in the late-1960s examined the location, bearing quality, and preliminary design elements of the anticipated dam structures. These preliminary studies indicated that the underlying granite bedrock is of high bearing and non-shearing quality, occurring at a depth of between around 6 to 55 feet at the proposed dam and raw water transmission main route locations. The initial analyses indicated that a stable substrate existed, providing adequate foundation stability and sealing capabilities for dam construction purposes at the affected locations. Should this alternative be considered further, additional geotechnical analyses would be conducted upon which detailed engineering designs would be based.

The seismic considerations are discussed in section 18C.5.7 below.

18C.3.4.1.2. Planning and Design

It is fully expected that the most current dam construction technology would be employed in the creation of the Ambrey Pond Reservoir's main, auxiliary, and diversion dams, and that the dams would be constructed in accordance with all applicable codes and standards. As noted above, engineering designs have not been prepared for the Ambrey Pond Reservoir; however, conceptual plans and designs have been advanced for long-range planning purposes. Should this alternative proceed, numerous additional analyses would be undertaken, including geotechnical and hydrological studies, upon which detailed plans and engineering designs would be based.

Detailed planning and design would follow substantive geotechnical and hydrological investigations of the reservoir impoundment and dam sites. Based on geological analyses and the volume of water to be impounded, final planning and design of the dam would refine dam details, such as length, height, and volume of the dam structures (i.e., base width), and a final determination of construction techniques to be utilized. The design would be expected to incorporate key operational components such as spillway capacity and final overflow elevation, incorporation of release structures and the mechanical equipment to operate them, internal

galleys and walkways as necessary to access operational elements, and drainage to allow for, collect, and discharge water seepage.

18C.3.4.1.3. Site Preparation, Excavation, and Dam Structural Construction

The first construction step is to create access roads into the construction site which would be built off Bulsontown and Cedar Flats Roads. Arrangements would be made with the Palisades Interstate Park Commission to gain access to the center median of the Palisades Interstate Parkway for access to the Tiorati Brook impoundment site.

The broad area to be inundated by the Ambrey Pond Reservoir and Tiorati Brook impoundments, including the dam sites, would be cleared of timber. In a staged manner based on construction phasing, soil overburden would be removed with excavation to bedrock in order to tie and set the base and abutment walls. Excavation within the inundation areas is expected to provide a substantial portion of the rock and soil material to be utilized in construction of the earth fill dam structures.

For dam construction, a typical early component is the construction of cofferdams that allow for diversion of water flow from sections of affected streams where construction work would be underway. For the main Ambrey Pond Reservoir dam, it is noted that stream flow is already controlled by the upstream existing rock and earthen dam, thereby limiting and controlling the stream channel location and width. This alternative would require a relatively wide and low dam. In such situations, controlling stream flow during excavation and construction of specific dam sections is not as critical a function as would be required with a higher dam structure in a narrow and steeply sloped gorge.

With stream channelization controlled, it is expected that the dams would be built in sections, with each section excavated to bedrock and new structures initiated from the base vertically toward the ultimate dam elevation. Once above stream level and with incorporated structures, new sections are initiated by creating new cofferdams or otherwise controlling and diverting the stream channel either through temporary or permanent structures, until each dam is complete including the cutoff, or curtain walls that tie the dam to the adjoining bedrock abutments, or side walls of the gorge or valley.

Final grading and stabilization would finish the dam construction and this would include excavation of materials located inside the impoundment area, and for the main Ambrey Pond Reservoir dam would include removal and excavation of the existing dam structure. The removal of the existing dam would be the reverse as described above, in terms of controlling stream channel and removal by section.

Based on earlier conceptual studies, the construction of the three dam structures was estimated to involve the excavation of about 15,000 cubic yards of soil and 11,000 cubic yards of rock. Additionally the construction of the earthen embankment for the auxiliary dam would require the excavation and processing of approximately 121,000 cubic yards of soil from within the footprint of the reservoir to be used as fill for the embankment. Approximately 26,000 cubic yards of concrete and 9,000 cubic yards of rip-rap would be required for the dam construction.

The Tiorati Brook diversion raw water transmission main construction would involve open cut construction, a technique that involves excavation of a linear trench approximately 7 to 8 feet wide and 8 feet deep in which the transmission main would be installed. The trench would then be refilled and regraded. The Tiorati diversion main would be routed along and within existing roadway rights-of-way, and segments would pass through Palisades Interstate Park Commission

land and United Water lands. Construction of this route would necessitate clearing and removal of approximately 3 acres of vegetation to create a 30-foot-wide corridor in which to place pipe, provide working space for construction equipment, and to provide maintenance access.

18C.3.4.1.4. Mechanical Equipment and Facilities

As the dam is constructed, critical infrastructure would be incorporated into the dam structure, such as intake piping, release valves, downstream apron, and channelization. Concurrently, the operational mechanical functions would be constructed, including the low-lift pumping station and raw water transmission main to transmit water from the reservoir to the water treatment plant, and the water treatment itself. Connections to the surrounding water system would be also constructed and readied for operation.

18C.3.4.2. IMPOUNDMENT AREA

As the dam construction proceeds, the main reservoir area would also be readied for impoundment. This would include removal or relocation of any infrastructure and utilities and, as noted above, the demolition of any remaining structures, and the removal of existing roadbeds. Based on further soils and geological testing, including fracture analysis, preparation would potentially include clay lining of the reservoir bed that could be considered as appropriate to control water seepage as the reservoir fills.

18C.3.4.3. WATER TREATMENT PLANT AND POTABLE WATER MAINS

The construction of the water treatment plant would occur during the dam construction phase. The construction would be similar to that of the Proposed Project's water treatment plant as described in section 15.2.2.4 of Chapter 15, "Construction Impacts." The topography of the site would necessitate shelving to provide an adequate site for the plant at the required 334-foot elevation. Initially, the water treatment plant would be sized for a production capacity of 2.5 mgd. Construction activities associated with the water treatment plant during Phase 2 would primarily consist of the installation of additional process mechanical equipment within the existing structures. Similar to the Proposed Project, expansion of the water treatment plant during Phase 3 would require expansion of building and structures along with the installation of additional equipment.

Construction of the two potable water mains from the water treatment plant would be similar to that described for the Proposed Project in section 15.2.2.5 of Chapter 15, "Construction Impacts." These mains would tie into the existing United Water distribution system. One 16-inch main, approximately 3,400 feet long, would connect with the Crickettown Heights service area, and the other 30-inch main, approximately 9,000 feet long, would connect with the existing distribution system in the vicinity of Goetschius Court. The finished water mains would be sized to accommodate the full build-out water treatment production capacity of 7.5 mgd.

18C.3.5. OPERATION

18C.3.5.1. OPERATION OF THE RESERVOIR AND WATER TREATMENT PLANT

The Ambrey Pond Reservoir Alternative would operate on a continuous basis throughout the year, and it is expected that actual throughput of the facility involving the treatment of potable water would vary according to daily and seasonal demand.

Operation of the two Ambrey Pond Reservoir dams and the Tiorati Brook impoundment would require inspection visits by United Water and by the NYSDEC, in compliance with New York State's dam safety requirements.[1]

The details of the water treatment plant and pump station operations have not been finalized, but it is anticipated that round-the-clock operation would require one to two on-site operators. The plant would require on-site storage and daytime delivery of chemicals necessary for routine water treatment processes. These are expected to include ferric chloride (a coagulant), sodium hydroxide (for pH control), sodium hypochlorite (chlorine, for disinfection), and corrosion control chemicals (e.g., SeaQuest).

18C.3.5.2. OPERATION OF THE UNITED WATER SYSTEM WITH THE AMBREY POND RESERVOIR

As described in Chapter 1, "Purpose and Need" (see section 1.3.1.3), United Water currently meets the demand for water with a network of water supplies from Lake DeForest, the Ramapo Valley Well Field, system wells, and the Letchworth Reservoirs. The amount of water provided from each source depends on the availability of water from that source and its permit conditions, which protect the water source, quality of the water produced, and the riparian rights of downstream water users. As discussed, United Water's current operational practice is to meet the demand for water by maximizing the use of Lake DeForest to the extent allowed by its permit and its safe yield, with the remaining water supplied from the other sources. During summer months, when demand is highest, United Water draws larger volumes from Lake DeForest to compensate for the lower volumes that can typically be withdrawn from the Ramapo Valley Well Field during that time. The system wells and Letchworth Reservoirs are used to provide the remaining water needed to meet demand.

As discussed in Chapter 2 (section 2.5.5), with the introduction of the new water supply source, United Water would continue to operate Lake DeForest in the same manner as it does today to meet water demand, maximizing use of the reservoir to the extent allowed by its permit and the limitations of its safe yield. The Ramapo Valley Well Field and Letchworth Reservoirs would also continue to be operated as they are today. The addition of the steady supply of Hudson River water would allow United Water to reliably meet summer demand. When demand lessens, the additional water source would allow the company to rest its supply wells, which can become overdrawn through constant use.

The Ambrey Pond Reservoir would also introduce a new water supply source with the same safe yield as the Proposed Project. Therefore, as with the Proposed Project, with the Ambrey Pond Reservoir in place United Water would continue to operate Lake DeForest, the Ramapo Valley Well Field, and Letchworth Reservoirs in the same manner as it does today. When additional capacity is available because of the additional water source, this would allow United Water to rest its supply wells.

Unlike the Proposed Project, however, the Ambrey Pond Reservoir would be susceptible to local drought conditions. Since its watershed is in the same general area as the other reservoirs, smaller rivers, and groundwater sources that currently supply United Water's system in Rockland County, it could be affected by drought conditions at the same time. In contrast, the proposed Haverstraw Water Supply Project would introduce a new surface water source to the

[1] Environmental Conservation Law, Article 15, Title 5, and 6 NYCRR 673.

Rockland County water supply system, the Hudson River, which, by virtue of its size and connection to the Atlantic Ocean, is far less affected by local drought conditions.

18C.4. AMBREY POND RESERVOIR ALTERNATIVE'S ABILITY TO MEET THE PURPOSE AND NEED OF THE PROPOSED PROJECT

As stated in Chapter 1, "Purpose and Need," the public need for, and benefit of, the long-term water supply project is derived from United Water's legal obligation to provide a safe, dependable, and adequate supply of potable water to most of Rockland County's residential and worker populations, as well as providing water for fire suppression. The demand for water in Rockland County has been increasing as these populations have grown, and water demands are projected to continue to increase into the future. Further, under Rate Orders from the PSC in 2006 and 2010, United Water has a specific obligation to increase the average water supply for Rockland County by a total of 1.5 mgd and the peak supply by a total of 7.1 mgd by the end of 2015, and to meet the long-term needs of the county beyond that date. Beyond 2015, a long-term water supply project will be needed to increase the system's safe yield to meet the future water demands of United Water's service area in Rockland County. For more information on the 2006 and 2010 Rate Orders, see Chapter 1, sections 1.2.4 and 1.2.5.

Like the Proposed Project, the Ambrey Pond Reservoir Alternative is evaluated for its ability to address these obligations by delivering up to 7.5 mgd to the existing United Water distribution system serving the county, for the exclusive use of United Water's Rockland County customers.

In addition to its ability to provide sufficient safe yield, a suitable long-term water supply project must also meet public need and benefits standards in several other critical areas, as discussed below.

18C.4.1. RELIABLE SUPPLY

The new long-term water supply project must improve the reliability of the water supply system while meeting future demands by introducing a supply that is less dependent on localized precipitation conditions. The Northeast experiences short-term droughts, defined as a drought having a duration of one to three months, every one to three years. Longer droughts (e.g., droughts lasting for more than three months) are experienced once every 20 to 30 years. The Hudson Valley, in which United Water's Rockland County service area is situated, has experienced fifteen such droughts since 1895, with one occurring approximately every seven and one-half years, with an average duration of 4.6 months.[1] There is increasing concern that global climate change may bring greater fluctuations in weather conditions, including more frequent or severe drought conditions or more frequent storm events.

Because the Ambrey Pond Reservoir Alternative contemplates a surface water reservoir, its safe yield and replenishment capacity is limited by the size of its watersheds that serve as the rainwater catchment basins. During Phase 1 of this alternative, the water source for Ambrey Pond Reservoir would be the reservoir's direct catchment area, comprising approximately 3.4 square miles. During this phase, it is estimated that this alternative would provide a maximum safe yield of 3.1 mgd. Phase 2 water resource development would supplement the reservoir's water supply with water diverted from Tiorati Brook, effectively expanding the reservoir's

[1] http://www.nrcc.cornell.edu/page_drought.html, accessed August 6, 2010.

catchment area by 9 square miles, resulting in a 12.1 square mile watershed. Thusly sourced, the Phase 2 Ambrey Pond Reservoir would be capable of supporting a safe yield or 7.9 mgd. Therefore, due to the water production limitations of its immediate watershed, it is not until Phase 2 that this alternative generates an adequate degree of drought tolerance necessary for a sustained supply of safe potable water.

In comparison, the Proposed Project would rely on the Hudson River as a source of water. The Hudson River watershed upstream of the Proposed Project is approximately 13,400 square miles. The Proposed Project would be designed to withdraw enough water from the Hudson to establish an ultimate safe yield of 7.5 mgd. Further, the amount of water withdrawn for the Proposed Project would represent a minute fraction of the total freshwater flow of the Hudson River. While the Ambrey Pond Reservoir Phase 2 development would generate a 7.9 mgd safe yield from its 12.1 square mile catchment area, the long term reliability of that catchment area is expected to be less than the long-term reliability of the Hudson River as a water source. Not only is the Hudson River's catchment area size a positive factor, but future changes in rainfall patterns, as well as increased evaporation rates resulting from increasing ambient temperatures could decrease the amount of water available from the reservoir's limited watershed area. For these reasons, in comparison to the Proposed Project, this alternative provides a less sustainable water supply source resulting in a limited ultimate safe yield.

18C.4.2. COST-EFFECTIVENESS

As a public utility, United Water has a responsibility to its customers, constituting the rate-payers, to develop a cost-effective project to address the need for new long-term water supply.

18C.4.2.1. CAPITAL COST OF THIS ALTERNATIVE IN COMPARISON TO THE PROPOSED PROJECT

As shown on **Table 18C-1**, below, the completed (Phase 3) Ambrey Pond Reservoir Alternative would cost between an estimated $261.1 million and $275.7 million (2010 dollars). These cost estimates include the Tiorati Brook diversion, reservoir and dam site preparation and dam construction, the water treatment plant construction, distribution system improvements, roadway relocations, and associated costs. In comparison, as discussed in section 2.8.4 of Chapter 2, "Project Description," the Proposed Project would cost between approximately $139.2 million and $189.3 million to complete.

Based upon these cost estimates, the Ambrey Pond Reservoir Alternative is expected to cost from $86.4 to $121.9 million more than the Proposed Project.

Table 18C-1
Comparative Summary of Capital Expenses and Rate Effects

	Ambrey Pond Reservoir Alternative	Proposed Project: Haverstraw Water Supply Project
Capital Cost	Phase 1: $225.7 to $238.2 million Phase 2: $17.1 to $18.5 million Phase 3: $18.3 to $19.0 million Total: $261.1 to $275.7 million	Phase 1: $97.2 to $144.8 million Phase 2: $16.7 to $16.9 million Phase 3: $25.2 to $27.8 million Total: $139.2 to $189.3 million
Estimated Annual Operating Cost	Phase 1: $1.7 million Phase 2: $2.8 million Phase 3: $3.9 million	Phase 1: $2.2 million Phase 2: $4.0 million Phase 3: $5.6 million
Average Daily Cost per Account (Ratepayer)	Phase 1: $1.55 to $1.62 Phase 2: $1.73 to $1.81 Phase 3: $1.99 to $2.07	Phase 1: $0.72 to $0.99 Phase 2: $0.91 to $1.17 Phase 3: $1.16 to $1.43
Average Daily Cost per Single-Family Household	Phase 1: $1.10 to $1.15 Phase 2: $1.23 to $1.29 Phase 3: $1.45 to $1.51	Phase 1: $0.51 to $0.70 Phase 2: $0.65 to $0.84 Phase 3: $0.85 to $1.05
Note: All amounts are shown as 2010 dollars. Estimated annual rates are based on anticipated capital and operating expenses, exclusive of Allowance for Funds Used During Construction (AFUDC). The PSC has the discretion to use tools to lessen the impact of rate adjustments to customers, or protract them over time.		

18C.4.2.2. ANNUALIZED LIFE-CYCLE COSTS OF THIS ALTERNATIVE IN COMPARISON TO THE PROPOSED PROJECT

The annual operating costs of the Ambrey Pond Reservoir Alternative would include the costs of operating and maintaining the reservoir, water treatment plant, and related facilities, equipment repairs, as well as the ongoing cost of consumables, such as electricity, gas, and process and cleaning chemicals. For this alternative, these estimated annualized life-cycle costs, excluding depreciation, personnel and property tax expenses, would be approximately $1.7 million during Phase 1, rising to $2.8 million during Phase 2, and costing annually an estimated $3.9 million at its completion, during Phase 3.

By comparison, as discussed in Chapter 2, "Project Description," the Proposed Project would have estimated annual operating costs of approximately $2.2 million per year during Phase 1, increasing to $4.0 million during Phase 2, and $5.6 million per year at completion of Phase 3.

18C.4.2.3. EFFECT OF THIS ALTERNATIVE ON COST OF WATER AND CONSUMER WATER RATES

Based on the estimated capital and operating costs of the Proposed Project and the Ambrey Pond Reservoir Alternative, the cost of producing potable water was determined, as well as the increase in cost of water delivered to consumers.

As shown above in Table 18C-1, the Ambrey Pond Reservoir Alternative when fully operational is expected to produce potable water at an annual operating cost of approximately $3.9 million. This compares with the Proposed Project's estimated Phase 3 annual operating cost of $5.6 million, discussed in section 2.8.4 of Chapter 2, "Project Description." Although the cost of production is lower for this alternative, the estimated capital cost of the Ambrey Pond Reservoir Alternative is expected to cost from $86.4 to $121.9 million more than the Proposed Project.

The capital and annual operating costs of the Proposed Project and this alternative would also affect the billed amounts for each rate-paying account, including residential, commercial, industrial, and municipal customers, as listed in Table 1-8, in Chapter 1, "Purpose and Need." Estimated increases to water rates for United Water customers were calculated assuming the future population anticipated when the alternative would be operational. It is expected that under this alternative, each account (i.e., ratepayer) would incur increased costs of approximately $1.55 to $1.62 per day during Phase 1, increasing in Phase 2 to $1.73 to $1.81, and reaching $1.99 to $2.07 upon full build-out at Phase 3. As shown on Table 18C-1, above, these ratepayer costs are greater than the corresponding daily costs for single-family households. It is expected that under this alternative, the increased daily costs per single family household would be approximately $1.45 to $1.51 at full build-out. The actual cost for individual ratepayers would vary based on type of account and water use, as commercial users generally use more water and pay higher rates than residential customers. As shown on Table 18C-1, above, these costs are greater than the corresponding consumer costs of the Proposed Project. Therefore, on balance, due to the greater capital expense of completing this alternative and its greater impact on individual ratepayers, this alternative would be less able than the Proposed Project to meet the public need and benefit of being cost-effective.

18C.4.3. ABILITY TO BE IMPLEMENTED IN STAGES

To meet future demands for water supply as they develop over time and to mitigate against any possible growth-inducing effects, the long-term water supply project should have the ability to be implemented in stages. Like the Proposed Project, the Ambrey Pond Reservoir Alternative would be developed in stages to meet growing water demands.

The Ambrey Pond Reservoir would be implemented in three phases as demand for water increases. The initial two phases would create a reservoir with a storage capacity capable of supporting a safe yield initially of 3.1 mgd, and ultimately 7.9 mgd, and a treatment capacity capable of meeting peak demands of 2.5 mgd and 5 mgd, respectively. The third phase would expand its peak water treatment capacity to 7.5 mgd. Because this alternative could be developed in phases, both the Proposed Project and the Ambrey Pond Reservoir Alternative would satisfy this purpose and need.

However, given the estimated 3.5-year construction period for Phase 1 and the likely longer period in advance of construction for additional design and permitting, it is not anticipated that the first phase of the Ambrey Pond Reservoir Alternative would be completed as quickly as the first phase of the Proposed Project. This first phase of the Ambrey Pond Reservoir Alternative would most likely not be in operation by the end of 2015, as required by a December 14, 2006 and July 20, 2010 Orders by the PSC.

18C.4.4. ABILITY TO AVOID AND MINIMIZE ENVIRONMENTAL IMPACTS

As an alternative new long-term water supply project, the Ambrey Pond Reservoir Alternative must avoid and minimize potential environmental impacts to the maximum extent practicable given the other goals and objectives for the Proposed Project and the capabilities of the Project sponsor. This includes environmental impacts that would potentially occur as a consequence of both the construction and operation of the Proposed Project.

In comparison to the Proposed Project, the Ambrey Pond Reservoir Alternative does not include construction or raw water intake operations within the significant habitat areas of the Hudson River and therefore avoids the Proposed Project's potential impacts on fisheries, benthic organisms, and significant habitat areas adjacent to the intake structure. (However, as described

in Chapter 9A, "Aquatic Natural Resources," the Proposed Project would minimize those impacts, and overall the Project was not found to result in significant adverse impacts on aquatic resources.) However, compared to the Proposed Project, this alternative has a much more extensive and broad range of construction impacts requiring substantial clearing, excavation, and importing of materials and workers to build the multiple dam structures, as well as other components comprising this alternative, including the new water treatment plant, potable water transmission mains, and as well as requiring roadway relocations, residential displacement, and the natural and cultural effects of clearing of nearly 200 acres in anticipation of future water inundation.

Under this alternative, the ecological communities in the Ambrey Pond Reservoir area would be completely and permanently inundated by the reservoir construction. The reservoir is expected to result in impacts on numerous species, including species of concern. On balance, however, this alternative's open water reservoir is expected to provide productive fisheries habitat for many species already present in the ponds that would be inundated by the reservoir. In addition, the threatened bald eagle may benefit from the expansive open water and shorelines created by the reservoir.

Operations of the reservoir could, however, have additional adverse impacts on terrestrial and aquatic life, including fisheries. In particular, the aquatic life in the reservoir and in Cedar Pond and Tiorati Brooks would be adversely affected during dry years when water draw-down would be the greatest. In contrast, the Proposed Project would not result in adverse effects to flora and fauna on the Project Sites. Any adverse impacts on aquatic resources in the Hudson River related to entrainment and impingement of fish at the intake structure would be minimized by the application of best technologies available, such as the use of a wedge-wire screen intake and low approach velocity intake rates.

In addition, the Ambrey Pond Reservoir Alternative would require the acquisition of an additional approximately 140 acres of land, and the potential displacement of approximately 13 residential structures from which residents would be displaced. The acquisitions would also potentially impinge on land used by scouting organizations for camp and recreational purposes, including portions of land associated with the Rockland Girl Scout Council's Camp Addison Boyce. The alternative would also result in the displacement of the Town of Stony Point's municipal swimming pool, which is located on United Water land within the reservoir buffer area.

In comparison to the Proposed Project, the Ambrey Pond Reservoir Alternative would result in more substantial adverse impacts on a greater range of environmental resources, and would therefore provide fewer public benefits than the Proposed Project in respect to mitigating environmental impacts.

18C.5. EFFECTS OF THE AMBREY POND RESERVOIR ALTERNATIVE

18C.5.1. LAND USE, ZONING, AND OTHER PROGRAMS

18C.5.1.1. LAND USE

Land uses in the vicinity of the Ambrey Pond Reservoir Alternative are low-density residential and open space, including a Town of Stony Point municipal swimming pool complex and Rockland County Girl Scout Council facilities. The potential reservoir site comprises large tracts of mostly undeveloped forested and open pond areas, most of which are owned by United Water. Similarly vegetated and open land under the jurisdiction of the Palisades Interstate Park

Commission abuts the reservoir site to the west. In addition, the surrounding area contains segments of Bulsontown Road, Cedar Flats Road, and Mott Farm Road. A high tension transmission line also traverses the southern extension of the surrounding area. The generalized land uses of the Ambrey Pond Reservoir Alternative study area are shown on **Figure 18C-5**.

The 2 billion gallon Ambrey Pond Reservoir would inundate an area of approximately 200 acres, permanently changing the land use and character of the affected area. As discussed above, it is expected that United Water would acquire approximately 140 additional acres, comprising 16 land parcels that would be completely or partially flooded by the reservoir. Several of these parcels are currently in residential use, and an estimated 13 residential uses would be displaced by these acquisitions. In addition, the Town of Stony Point's municipal swimming pool complex is located on land currently owned by United Water. Should the reservoir be constructed, this facility would be among the uses that would be displaced. This property is leased to the town on a year-to-year basis; it is anticipated that the lease would be terminated upon construction of this reservoir.

In addition, portions of three roadways, Bulsontown Road, Cedar Flats Road, and Mott Farm Road would also be inundated and would require a realignment to allow for a continuing flow of traffic. Finally, portions of the high tension electric utility lines running through the area would require some reconfiguration to maintain its capabilities.

It is expected that the Ambrey Pond Reservoir Alternative would be secured by chain-link fence running around the perimeter of the area. The fence would be visible, as well as would inhibit access by the general public, and would represent a perceptual and visual change in the area's land use. In addition, while the open water reservoir could be construed by some as a compatible land use, during periods of reservoir drawdown, the lowered water level would expose a shoreline consisting predominately of bottom silt. To the extent that it would be visible, the reservoir during drawdown periods would appear as an unnatural landscape element in an area that is predominately undeveloped and dominated by natural landscape features.

18C.5.1.2. ZONING

The majority of the area that would be affected by this alternative is currently zoned as the Ambrey Pond Reservoir Protection (APRP). The creation of the Ambrey Pond Reservoir is a use that would therefore be compatible with the current zoning district.

18C.5.1.3. OTHER PROGRAMS

The 1995 Town of Stony Point Master Plan cites the Ambrey Pond Reservoir site for potential reservoir development, and references the need for a new community water supply. As noted in Chapter 3, "Land Use, Zoning, and Other Programs," the town's Master Plan states that "at some undetermined time in the future, the Ambrey Pond Reservoir project of United Water New York will happen…The need for the project was established and the start time was tied to certain water usage levels." Consequently, the reservoir site and the surrounding area are zoned specifically for Ambrey Pond Reservoir Protection.

The 2011 Rockland County Comprehensive Plan, "Rockland Tomorrow," stresses the importance of maintaining adequate water supply, including investigating potential water sources in the county while promoting water conservation. Like the Proposed Project, the Ambrey Pond Reservoir Alternative would support this goal by introducing a new water supply source that would meet future demands and provide the same safe yield as the Proposed Project. However, as described above, the Ambrey Pond Reservoir Alternative would be more

susceptible to drought, and would result in more substantial adverse impacts on a greater range of environmental resources as compared with the Proposed Project.

The Ambrey Pond Reservoir Alternative would occur outside the coastal zone of the Town of Stony Point, and likely outside the area of effect of the town's Local Waterfront Revitalization Program (LWRP), and likely beyond the area of concern of LWRPs of surrounding towns or the New York Department of State's coastal zone and policies. Policies pertaining to promoting access to and protecting resources within the Hudson River and coastal areas would likely not apply to this alternative.

Both the Proposed Project and Ambrey Pond Reservoir Alternative would not adversely affect the goals or policies of other programs, including the programs described in Chapter 3, "Land Use, Zoning, and Other Programs," section 3.2.3.

18C.5.2. VISUAL RESOURCES

18C.5.2.1. INVENTORY OF RESOURCES

The Ambrey Pond Reservoir site is located adjacent to the Hudson Highlands Scenic Area of Statewide Significance (SASS), established by the New York State Department of State (NYSDOS). As discussed in more detail in Chapter 4, "Visual Resources," this SASS encompasses a 20-mile stretch of the Hudson River and its shorelands. On the west side of the Hudson, the southern boundary of the SASS consists of the boundaries of Bear Mountain State Park and Harriman State Park. The Ambrey Pond Reservoir would be adjacent to this SASS boundary.

Other visual resources in the area around the Ambrey Pond Reservoir include Bear Mountain State Park (including the historic resources in the park), Harriman State Park, and the visual resources described in Chapter 4 as far south as (and including) South Mountain County Park and High Tor State Park.

18C.5.2.2. EFFECTS ON VISUAL RESOURCES

During periods when the water level of the Ambrey Pond Reservoir is high, the reservoir would present a compatible visual feature in the landscape, since it would change, but would not fundamentally alter, the undeveloped and rural character of the affected landscape. At times of reservoir drawdown, however, the reservoir would present a shoreline above the water level characterized by non-vegetated bottom sediments. At these times, the reservoir would appear as an unnatural feature in an otherwise natural-appearing vegetated landscape. It is anticipated that the reservoir would also be surrounded by a chain-link security fence that would be somewhat visible from surrounding public roadways.

In some instances the character of the area would change as a result of the demolition of existing structures, including residences, returning them to a more natural character. While this would represent a minor change to the character of the area, it would not result in any adverse visual impacts. The surrounding vegetation would provide screening of the reservoir, and where visibility would be possible, the reservoir would provide long views of vegetated shorelines over open water. These views might be considered by some to be attractive improvements to more densely vegetated and forest lands.

In terms of effects on visual resources in the surrounding area, the natural character of the reservoir would in general be in keeping with the character of Bear Mountain State Park and Harriman State Park. The clearing of more than 400 acres of land for the reservoir and for

relocation of roadways around the reservoir would create a noticeable gap in the forested area in which the new reservoir would be visible. The Hudson Highlands SASS documentation published by NYSDOS notes that the variety of vegetation and unifying continuous vegetative cover of the SASS make a significant contribution to the scenic quality of the SASS, and that removal of vegetation in the SASS could impair its scenic quality. It also notes that clearcutting or removal of vegetation on the wooded bluffs along the Hudson River and in the upland areas would change the character of the river corridor and impair its scenic quality. The new Ambrey Pond Reservoir under this alternative would not affect a river bluff, but would change the appearance of a wooded area that would be visible in views from the surrounding hills in Bear Mountain State Park (including Dunderberg Mountain) and Harriman State Park. On the other hand, the trees would be replaced with another natural-appearing feature (e.g., an open body of water) that would be generally consistent with the other lakes and ponds located throughout both parks.

In light of the above, the Ambrey Pond Reservoir Alternative is not expected to result in a significant adverse impact to visual resources. The Proposed Project is also not expected to result in significant adverse impacts to visual resources.

18C.5.3. COMMUNITY FACILITIES

18C.5.3.1. SCHOOLS

The Ambrey Pond Reservoir Alternative would result in the creation of fewer than 10 new full-time jobs, and potentially result in the in-migration of two households into the Stony Point vicinity. As a consequence, the alternative would not be expected to generate significant increases in school enrollment. The reservoir construction would, however displace residents occupying homes that United Water would have to acquire in the reservoir inundation area. This displacement could, therefore, result in minor changes to school enrollment should any displaced households with school-age children relocate out of the affected school districts.

18C.5.3.2. FIRE, POLICE, EMERGENCY SERVICES, AND RECREATIONAL RESOURCES

The construction phase of the Ambrey Pond Reservoir Alternative is expected to result in short-term increased demands on local police services during the construction period. The relocation of segments of Bulsontown, Cedar Flats, and Mott Farm Roads would result in temporary disruption to traffic patterns, and would require traffic management by local police services during the roadway reconstruction period. In addition, other localized construction activities associated with this alternative would be expected to require temporary traffic management services. Once constructed, the operational phase of this alternative is not expected to generate any significant increases in the demand for fire, police, or emergency services.

To the extent that the reservoir would cause the relocation of several area roads, emergency response time to portions of the service area accessed by these roadways may be affected. This may cause adjustments to response procedures to maximize efficiency.

The Town of Stony Point's municipal swimming pool complex is located along Bulsontown Road, on a parcel of land owned by United Water. The pool is available to town residents, and consists of an Olympic-size swimming pool, a wading pool for small children, basketball courts, a picnic area, and streamside fishing. The pool complex would be displaced upon the implementation of this alternative, thereby resulting in a significant adverse negative impact to the town's recreational facilities. The acquisition of a portion of the Rockland County Girl Scout Council's Camp Addison Boyce property and a portion of the Rockland County Boy Scouts Council site is not expected to

affect the recreational use of these lands. The reservoir would, however, be expected to provide limited public access for fishing. In addition, as discussed above in section 18C.3.2.3, it is anticipated that the Tiorati Brook diversion and associated water transmission main easements may affect Palisades Interstate Parkway and Harriman State Park lands.

Therefore, like the Proposed Project, the Ambrey Pond Reservoir Alternative would not result in significant adverse impacts on schools, fire, police, or emergency services. This alternative would, however, have a significant adverse impact on a public recreational area and resource.

18C.5.4. SOCIOECONOMIC IMPACTS

The Ambrey Pond Reservoir Alternative would displace an estimated 13 residential structures, as well as the Town of Stony Point's municipal swimming pool complex. The displacement of households and residents could result in a loss of population to the Town of Stony Point, although there is the possibility that displaced households would relocate within the town. The displacement of these residences would result in a net loss of housing units in the town. Although the displacements would result in adverse impacts on the affected households, due to the small numbers of households affected, no significant adverse impact to the town's population or socioeconomic composition is anticipated to occur.

United Water currently owns 31 parcels of land at the Ambrey Pond Reservoir site, including 2 parcels southeast of the reservoir site along West Main Street and John F. Kennedy Drive, comprising a total of 319 acres. The Town of Stony Point 2009–2010 taxable assessed value of these parcels is $1,136,240, with an additional assessment of $2,324,233 for special franchise tax purposes. These United Water parcels generate property taxes for the Town of Stony Point, Rockland County, and a variety of special districts, including fire, lighting, solid waste, and ambulance districts. Based on the most recent data available from United Water, for the 2009-2010 tax period, the lands owned by United Water generated approximately $1.16 million in taxes, with about 75 percent of those taxes, or approximately $867,000, representing school district taxes, and $293,000 in tax revenues to the town, county, and special districts. About 68 percent, or $786,000, was generated by the franchise tax on the lands owned by United Water.

As shown on Figure 18C-3, and as discussed in section 18C.3.2 above, United Water would have to acquire all or portions of 16 additional parcels. While the exact configuration of the acquisition area has yet to be determined, it is known that the net real property tax assessment of the entirety of the affected parcels is approximately $17 million. These parcels currently generate an estimated $5.9 million in property taxes, of which approximately 72 percent of these tax payments, or about $4.3 million, represents school district taxes, and approximately $1.6 million is paid to the town, county, and special districts. Since this alternative would require the acquisition of only portions of several of these parcels, it is anticipated that the taxes currently generated by these parcels would be apportioned between United Water and the entities owning the remaining portions not acquired by United Water, resulting in no net loss of taxes generated.

It is important to note that several of the affected parcels are currently tax-exempt, including approximately 95 acres owned by the nonprofit Rockland County Girl Scout Council (Camp Addison Boyce), and the Rockland County Boy Scouts Council, as well as lands owned by the St. James Bible Church. Upon acquisition by United Water, these exempt parcels would become taxable to the Town of Stony Point and the school district, resulting in an increase in tax revenues for the affected jurisdictions.

As noted above, United Water currently owns land on which it pays approximately $1.16 million in annual property taxes to the Town of Stony Point, Rockland County, the North Rockland School

District, and several town special districts. Future property tax revenues for the Ambrey Pond Reservoir Alternative have been estimated based on the assessed value of the lands that would be acquired, as well as the value of reservoir-related improvements at the completion of each construction phase.

The tax generation projections assume that the improvements and land values associated with the Ambrey Pond Reservoir Alternative would increase United Water's current $1.14 million assessed valuation on its existing lands by approximately $15 million. This assessment increase would reflect an estimated Phase 1 assessment value of $12.7 million, an additional incremental increase of $1.2 million reflecting improvements made during Phase 2, and a final incremental increase in taxable assessed value of $1.1 million in Phase 3. These estimated taxable assessed value increases reflect the Town of Stony Point use of a 12.72 percent uniform percentage of estimated market value to determine taxable assessed value.

It is important to note that these estimated future taxable assessed values represent an approximate mid-point in a likely range of anticipated construction values, and that the actual assessed value upon which taxes would be levied would ultimately be determined by the Town of Stony Point assessor's office prior to or following construction. In addition, as noted below, the tax rates levied on real property are subject to change over time. Changes to assessment policy and equalization rates are other factors subject to change that are beyond the control of United Water.

This estimation uses an aggregated tax rate of $343.56 per $1,000 taxable assessed valuation, reflecting the tax rates as shown on Town of Stony Point tax payment receipts for 2009/2010. This aggregated rate reflects the tax rates that would apply to the reservoir properties, and includes the taxed levied by the Town of Stony Point, special districts, the North Rockland School District, and Rockland County. The year of analysis, 2010, is the base year. An escalation factor is applied to project the estimated base year taxes into the future. The estimated base year tax revenues for each phase were adjusted using an assumed consumer price index (CPI) factor of 3 percent per year to reflect the passage of time. This escalation factor is likely conservative, as the average overall tax rate increase of the affected jurisdictions has been approximately 10.9 percent per year during the 1998 through 2008 period. The resulting estimated total future property tax revenues to all affected jurisdictions are shown in **Table 18C-2**, below.

As shown in Table 18C-2, the Ambrey Pond Reservoir Alternative would be expected to generate total real estate tax revenues of approximately $6.58 million in 2016, the first full tax year in which this alternative would be in full operation. Estimated tax revenues would be expected to increase to approximately $8.2 million in 2021, the first full tax year following the projected Phase 2 expansions to a production capacity of 5 mgd. For the purposes of this analysis, an illustrative year of 2030 was chosen as the first full tax year of the fully built-out Phase 3 Ambrey Pond Reservoir, at which time an estimated total tax generation would be approximately $12.65 million per year.

In comparison to the Projected Project, the Ambrey Pond Reservoir Alternative would be expected to generate higher tax payments, resulting in higher annual costs to United Water and its ratepayers, as reflected in Table 18C-1. A comparison of estimated future tax costs is presented in **Table 18C-3**, below.

Table 18C-2
Estimated Ambrey Pond Reservoir Property Tax Generation

Phase	Factor	Year		
		2016	2021	2030
Phase 1	Increase in assessed value	$12.7 million	$12.7 million	$12.7 million
	Current total tax rate	$343.56	$343.56	$343.56
	Base year taxes	$4.35 million	$4.35 million	$4.35 million
	Taxes paid on existing United Water lands	$1.16 million	$1.16 million	$1.16 million
	Estimated total base year total taxes	$6.05 million	$6.05 million	$6.05 million
	Years out	6	11	20
	CPI trend	3%	3%	3%
	Projected total tax payments for Phase 1	$6.58 million	$7.62 million	$9.95 million
Phase 2	Increase in assessed value resulting from Phase 2		$1.2 million	$1.2 million
	Current total tax rate		$343.56	$343.56
	Base year incremental taxes		$0.42 million	$0.42 million
	Years out		11	20
	CPI trend		3%	3%
	Projected total tax payments for Phase 2		$0.57 million	$0.75 million
Phase 2	Increase in assessed value resulting from Phase 3			$1.08 million
	Current total tax rate			$343.56
	Base year incremental taxes			$0.37 million
	Years out			20
	CPI trend			3%
	Projected total tax payments for Phase 3			$1.95 million
Total Projected Taxes by Year		**$6.58 million**	**$8.20 million**	**$12.65 million**

Notes: Indicated Total Assessment represents estimated market value of anticipated improvements and necessary land acquisitions adjusted by Town of Stony Point's 12.72 percent uniform percentage of value. Current total tax rate includes town, special districts, North Rockland School District, and Rockland County taxes.

Sources: 2009/2010 Town of Stony Point Tax Payment Receipts for properties owned by United Water.

Table 18C-3
Comparison of Estimated Future Property Tax Payments

	Phase 1	Phase 2	Phase 3
Proposed Project	$2.95 million	$3.99 million	$6.34 million
Ambrey Pond Reservoir	$6.58 million	$8.20 million	$12.65 million

Note: Proposed Project data derived from Table 6-18, Chapter 6, "Socioeconomics."

The construction of the Ambrey Pond Reservoir Alternative is expected to result in an overall investment of an estimated $2611 to $275.7 million. In addition, the creation of this alternative would require approximately $6.4 million for additional land acquisition. In addition, easement acquisitions will also be required. These expenditures would represent investments in the local, regional, and statewide economies, resulting in direct and indirect economic benefits in the form of business and economic stimulation. In addition, the construction of the reservoir and associated facilities would result in the generation of wages and salaries, as well as corporate and personal income taxes and sales tax revenues. With a higher cost of construction than the

Proposed Project, the resulting economic benefits would also be higher than those of the Project, which are described in section 15.3.4 of Chapter 15, "Construction Impacts."

The construction is expected to generate a significant number of construction-related jobs during the eight-year construction period. The construction workers would be expected to generate substantial localized economic activity in the Town of Stony Point, particularly in respect to purchases of meals and fuel for vehicles. These construction jobs would not represent permanent jobs that would remain in the vicinity of the reservoir construction area. The operational period of this alternative is expected to generate fewer than 10 new full-time jobs to operate and maintain the reservoir and associated pumping and treatment facilities.

As discussed above, when fully operational at Phase 3, the Ambrey Pond Reservoir Alternative would increase the average daily cost paid by United Water account holders (ratepayer) by approximately $1.99 to $2.21 upon completion of Phase 3 of this alternative.

Therefore, like the Proposed Project, the Ambrey Pond Reservoir Alternative is not expected to have a significant adverse impact on the socioeconomic composition of the local community, and would be expected to have an overall positive effect on the local, regional, and statewide economies. This alternative would, however, result in a significant adverse impact on any individual residents that would be displaced by reservoir construction, and those that use the recreational facilities mentioned above, but would not result in adverse impacts on the Town of Stony Point's socioeconomic character.

18C.5.5. CULTURAL RESOURCES

An archeological investigation of the Ambrey Pond Reservoir Alternative was conducted by Dumont Archeological Surveys in 1978 and in 1979.[1] The investigations identified 16 prehistoric sites, four historic homesteads, and two apparently previously identified prehistoric sites: an "Indian village site" and "Indian Rock House." It is possible that additional resources are present in the Ambrey Pond Reservoir site and 500-foot buffer area. The archaeological potential of the Tiorati Brook impoundment site, the raw water main route from Tiorati Brook to the reservoir, and the road realignment areas has not been evaluated yet. If resources determined to be eligible for the State or National Register of Historic Places (S/NR) are identified in these areas, inundation or disturbance through subsurface excavation would be considered adverse impacts.

None of the structures expected to be demolished for reservoir construction appear to be historic resources or meet criteria for S/NR listing. However, there is one potential historic resource on the reservoir site, a two-story farmhouse with an outbuilding located along Bulsontown Road, that appears to date from ca. early to mid-19th century and appears to meet criteria for S/NR listing in terms of age and historic significance. Therefore, apart from the farmhouse and outbuilding, there are no other potential historic resources on the Ambrey Pond Reservoir sites.

The Ambrey Pond Reservoir Alternative therefore has the potential to result in significant adverse impacts on archaeological resources, and could potentially result in significant adverse impacts on historic resources either through direct disturbance or alterations to their context and setting. In comparison, the Proposed Project would affect small areas that may have the potential to contain archaeological resources and would not affect any historic resources. Additional

[1] *Stage 1B Cultural Resource Survey of the Ambrey Pond Project*, Stony Point, New York. August 1, 1979. Prepared by Dumont Archeological Surveys, Monroe, New York.

investigation would be performed of the possible archaeological resources and, if appropriate, mitigation measures would be implemented.

18C.5.6. GEOLOGY, SOILS, AND GROUNDWATER RESOURCES

18C.5.6.1. SOILS

The soils in and immediately surrounding the area of the Ambrey Pond Reservoir Alternative have been mapped and described by the U.S. Department of Agriculture (USDA) Soil Conservation Service in the Soil Survey of Rockland County, New York, and the USDA Natural Resources Conservation Service National Cooperative Soil Survey. The major soil units at Ambrey Pond primarily consist of well decomposed organic material (Carlisle Complex).

The construction of the reservoir and its associated facilities would not be expected to result in any significant impact on soil resources, although significant soil movement and flooding would be necessary due to grading at dam site locations and reservoir inundation. Existing exposed soil would be covered by water, so there may be accumulation of sediments at the reservoir floor with insignificant changes in the soil properties.

18C.5.6.2. GEOLOGY

Based on currently available existing information, including the Geologic Map of New York, Lower Hudson, the Surficial Geologic Map of New York, Lower Hudson Sheet, and information contained in the Ambrey Pond Reservoir DEIS of 1979, the Ambrey Pond Reservoir area is underlain by a thin layer of topsoil overlying glacial till and bedrock. The glacial till likely consists of a dense well-graded mix of primarily sand and gravel, with variable amounts of silt and clay. The glacial till cover is relatively thin on the valley slopes, but ranges up to 60 feet or more in thickness at the valley floor. Based on the available geologic bedrock maps the bedrock in the area consists of metamorphosed Hornblende granite and granitic gneiss.

The construction of the Ambrey Pond Reservoir Alternative would involve significant disturbances to the land surface, particularly in the immediate vicinity of the dams to be constructed or reconstructed. As discussed above, the construction of the reservoir would involve removal of substantial overburden materials for use in dam construction. The sites for the dam structures would be excavated to bedrock to enable the dam foundations to be grouted to underlying bedrock materials.

Once operational, the Ambrey Pond Reservoir Alternative would have a limited effect on-site geology after the construction phase is completed. The Proposed Action would not have an impact on site geology.

18C.5.6.3. GROUNDWATER RESOURCES

Groundwater resources in the vicinity of the Ambrey Pond Reservoir site, including the reservoir and water treatment plant, exist primarily in the bedrock aquifer and, to a lesser extent, in the till and isolated stratified drift deposits (sand and gravel) found in the area. No long-term significant impacts on the local groundwater resources as a result of implementing this alternative are anticipated.

The creation of the reservoir would, however, raise the natural groundwater levels and recharge to the overburden and bedrock aquifer in the immediate vicinity of the reservoir. Measurable changes would likely be isolated to currently undeveloped parcels, a majority of which are already owned by United Water. During periods of high surface water flow, it is not anticipated that groundwater recharge downstream of the Ambrey Pond Reservoir would be significantly

impacted. During periods of low surface water flow, conditions near the stream area below the proposed reservoirs may exhibit lower groundwater recharge if the current natural surface water flow is lowered as part of the overall operation.

Currently there are no United Water public water supply wells in service or off-line within one mile of the area affected by this alternative. The closest such wells are more than a mile away, and include Thiells #50, Thiells #51, and the off-line Garnerville #46. Private wells are, however, present in the vicinity of this alternative. One community public water supply system associated with the Cedar Brook Mobile Home Park is located southwest of the reservoir along Cedar Flats Road near the site of the proposed auxiliary dam. No long-term significant impacts on these local groundwater resources as a result of this alternative are anticipated.

Previous studies have indicated that the bedrock underlying the Ambrey Pond Reservoir Alternative is relatively impermeable. However, while it is difficult to quantify, it is expected that there would be some leakage of impounded waters into the bedrock aquifer. This leakage is not expected to result in significant adverse impacts on groundwater quality for the United Water bedrock supply wells closest to the reservoir site discussed above, to the Cedar Brook Mobile Home Park community water supply located southwest of the Ambrey Pond Reservoir (although it is unknown whether this system is operational), or to other wells in the vicinity of the reservoir site.

Because the dams are founded on more or less impervious bedrock, which will be grouted, the reservoir basin would be contained, with little groundwater movement out of the basin. If seepage around or under the dams into the groundwater should occur, the groundwater level in the area below the dam may rise to the point where it would surface as springs, and the surface areas immediately surrounding these springs would become wet or at least damp in nature.

Therefore, like the Proposed Project, the Ambrey Pond Reservoir Alternative would not result in significant adverse impacts on soils, geology, or groundwater resources.

18C.5.7. SEISMIC CONSIDERATIONS AND HAZARD POTENTIAL

The Ramapo Fault alignment is within a close proximity to the Ambrey Pond Reservoir Alternative area. The Ramapo Fault system is located southwest of Thiells, New York, and consists of the main northwest-trending trace of the Ramapo Fault and several faults trending north through the Watchung Mountains. Between Thiells, New York and the Hudson River, the Ramapo Fault system branches, with one branch continuing on as the Willow Grove, Blanchard Road, Cedar Flats, Ambrey Pond, and Timp Pass Faults. The more southerly branch consists of a series of on strike and echelon structures known as the Letchworth, Thiells, and Mott Farm Road Faults.

It appears that a portion of the known Ramapo Fault zone forms the valley across which the proposed auxiliary earth fill dam is to be located. This segment has been named the Ambrey Pond Fault. Although not recognized in the available literature, it is entirely possible that another branch of the Ramapo Fault system lies within the valley crossed by the proposed concrete dam, actually passing through Lower Ambrey Pond.

Previous studies indicate that the fault system has not been active in the sense of major plate boundary activity (e.g., California-type) since the Late Cretaceous period, some 90 to 70 million years ago. Thus, while minor earthquake activity is to be expected in the region, no surface ground rupture is expected based on the duration since the most recent near surface fault movement.

18C.5.7.1. SEISMIC SHAKING

Earthquake activity in the general region of the site has been experienced since 1737. Ground shaking at the Ambrey Pond site has been evaluated based on the 2002 seismic hazard maps developed by the U.S. Geological Survey (USGS). The USGS Seismic Hazard Maps are probabilistic ground motion maps that provide peak ground accelerations (PGA) and spectral accelerations (SA) for seismic events with a given probability of occurrence (recurrence interval). PGA is the level of shaking anticipated at the ground surface and SA is approximately the level of shaking experienced by typical buildings (as a percent of gravity). The Maximum Considered Earthquake (MCE) ground motion considered in the 2007 New York State Building Code for the Ambrey Pond Site is determined from the probabilistic ground motion map adopted from USGS 2002 National Seismic Hazard Maps for a seismic event with a 2 percent probability of exceedance in 50 years (e.g., a return period of 2,475 years).

18C.5.7.1.1. Ambrey Pond Reservoir Dam Sites

PGAs estimated for the Ambrey Pond reservoir site based on the 2002 USGS hazard maps are summarized below, in **Table 18C-4**, which includes PGAs for earthquake events with return periods ranging from 500 years to 5000 years, corresponding to probabilities of exceedance in 50 years of approximately 10 percent to 1 percent, respectively. This range of earthquake return periods is representative of typical seismic design criteria found in current standards for dam structures of the type anticipated for this alternative.

Table 18C-4
Peak Ground Acceleration (g)
For Various Earthquake Return Periods

Earthquake Return Period	Peak Ground Acceleration
500-year Event	0.05g
1000-year Event	0.09g
2500-year Event	0.20g
5000-year Event	0.33g
Source: USGS 2002 National Seismic Hazard Maps.	

SAs estimated for the Ambrey Pond reservoir based on the 2002 USGS hazard maps are summarized below, in **Table 18C-5**, which include SAs for earthquake events with return periods ranging from 500 years to 2,475 years (corresponding to probabilities of exceedance in 50 years of approximately 10 percent and 2 percent, respectively).

Seismic site soil classes are defined in the New York State Building Code, and cover a range of subsurface conditions. The New York State Building Code definitions of seismic site soil Classes A through E are summarized in Chapter 8A, "Geology, Soils, and Groundwater Resources," Table 8A-2. Based on the existing regional geologic information, the anticipated relevant site soil class for the Ambrey Pond Reservoir dam sites is bedrock. The PGAs provided above in Table 18C-4 are mean values for sites directly underlain by bedrock, and are considered representative for the sites of the Ambrey Pond Reservoir dams.

Table 18C-5
Ambrey Pond Reservoir Spectral Response Acceleration (5 percent damping)

Period (seconds)	Earthquake Return Periods			
	500 year event (g)	1,000 year event (g)	1,500 year event (g)	2,475 year event (g)
0 (PGA)	0.05	0.09	0.13	0.20
0.2	0.10	0.18	0.24	0.34
1.0	0.02	0.04	0.05	0.07

Notes: PGA is the level of shaking anticipated at the ground surface; spectral acceleration is approximately the level of shaking experienced by typical buildings in the event of a seismic event. g = percent of gravity.
Source: USGS 2002 National Seismic Hazard Maps.

18C.5.7.1.2. Ambrey Pond Reservoir Water Treatment Plant Site

In addition to the dams, this alternative includes the construction of a water treatment plant. The water treatment plant would be constructed on a filled site at an elevation of 334 feet. The relevant site soil class for such a structure not underlain by bedrock is anticipated to range from Class C to Class D. Typically, seismic ground motions will be amplified at sites with significant thicknesses of soft or loose soils. To address the variable site conditions anticipated to be encountered at this alternative's Water Treatment Plant Site, spectral accelerations can be modified based on the procedures from the New York State Building Code. A summary of the New York State Building Code spectral accelerations for the anticipated range of treatment plant location site classes is provided in **Table 18C-6** below:

Table 18C-6
Spectral Accelerations for the Ambrey Pond Treatment Plant Site Soil Classes

Period (seconds)	Spectral Response Acceleration (g) (5 percent damping)	
	Site Class C (Very Dense Soil and Soft Rock)	Site Class D (Stiff Soil)
0 (PGA)	0.11	0.14
0.2	0.28	0.35
1.0	0.08	0.11

Source: 2007 New York State Building Code.

Per the New York State Building, Code the design spectral accelerations are 2/3rds of the MCE (2,475 yr event) values from the 2002 USGS seismic hazard mapping. This reduction results in New York State Building Code design spectral response values corresponding to 2002 USGS spectral accelerations for events with return period of 1,000 to 1,500 years.

18C.5.7.1.3. Evaluation of Seismic Risk

The anticipated seismic shaking based on the USGS seismic hazard maps, the New York State Building Code and the anticipated geologic conditions of the Ambrey Pond Reservoir dam and Water Treatment Plant Sites indicates a relatively low hazard risk due to seismic shaking. PGAs are anticipated to be less that 0.14 g for the New York State Building Code design seismic event, and considerably less for smaller earthquake events, which are more likely to occur during the life of this alternative (e.g., an event with a 10 percent chance of exceedance in 50 years [500-year

return period]). These levels of shaking, though not insignificant, would be accommodated through standard design procedures and conformance to applicable codes and construction practices.

18C.5.7.2. RISK OF DAM FAILURE DUE TO SEISMIC CONSIDERATIONS

Based on the proximity of the main and auxiliary Ambrey Pond Reservoir dams to known faults, the minimum age of the most recent fault movement, and the anticipated local faulting mechanisms, the failure of the dams due to a surface fault rupture is considered unlikely. The anticipated seismic shaking at the site based on the USGS seismic hazard maps and the anticipated geologic conditions indicates a relatively low hazard due to seismic shaking. PGAs are anticipated to be less than 0.33g for the likely maximum credible earthquake event, and considerably less for smaller earthquake events which are more likely to occur during the life of the reservoir. These levels of shaking, though not insignificant, can be accommodated provided the dams and related structures are designed and constructed in accordance with applicable current seismic codes and standards.

Based on the anticipated low potential for seismic risk, the failure of the dams due to a surface fault rupture is considered unlikely. The anticipated seismic shaking at the site based on the USGS seismic hazard maps and the anticipated geologic conditions indicates a relatively low hazard due to seismic shaking. The levels of shaking that potentially could occur during the lifespan of the reservoir, though not insignificant, are expected to be accommodated on the basis that both the earth fill and rolled concrete construction type dams would be designed and would be constructed to meet current dam codes and standards, including seismic considerations, provided that the dams and related structures are designed and constructed in accordance with applicable current seismic codes and standards.

Upon review of the Ambrey Pond Reservoir dam designs analyzed in the 1979 DEIS, the NYSDEC found that "the main dam, if constructed as designed, will withstand earthquake accelerations of up to 0.2g (20 percent of the acceleration due to gravity) without exceeding the design criteria. The main dam would not overturn if exposed to acceleration up to 0.46g, and would not fail due to sliding with accelerations of up to 4.4g. The auxiliary dam would have a safety factor of 1.25 against a sliding failure if exposed to accelerations of 0.15g."[1]

Dam failure risk due to seismic or fault line conditions were therefore determined to be minimal. Therefore, the dam structures required for the Ambrey Pond Reservoir Alternative are not expected to be adversely affected by earthquake or other seismic hazards.

18C.5.7.3. IDENTIFICATION AND CHARACTERIZATION OF DOWNSTREAM HAZARD AREAS, INCLUDING POTENTIAL COASTAL AREA EFFECTS

This section identifies and characterizes the areas downstream of Ambrey Pond Reservoir that comprise areas potentially affected by the unlikely failure of either or both Ambrey Pond Reservoir dams. A number of factors, including age, construction deficiencies, inadequate maintenance, and seismic or weather events, contribute to the potential of dam failure.[2] The

---

[1] Finding Number 60, In the Matter of the Applications of the Spring Valley Water Company, Inc. (Ambrey Pond Project) for permits to construct a reservoir, diversion pipelines and a water treatment plant, all known as the Ambrey Pond Project in the Town of Stony Point, Rockland County, DEC Project No. 334-06-0059 Water Supply Application No. 6971, NYSDEC, January 6, 1987, Decided, Final Decision of the Commissioner.

[2] Powers, K., 2005. *Aging Infrastructure: Dam Safety*. Congressional Research Service, September 29, 2005 (updated March 2008). See: http://www.fas.org/sgp/crs/homesec/RL33108.pdf.

Ambrey Pond Reservoir dams would be modern, code-compliant new construction, and proper maintenance is assumed. Further, as discussed above, dam failure due to seismic events is considered unlikely. Given the unlikelihood of a failure, and due to the uncertainties of what could constitute a failure, including uncertainties about the resulting volume, rate, and velocity of water flows, any assessment of impacts on the environment resulting from a failure event would be speculative. Notwithstanding the unlikelihood of a failure and the uncertainties of predicting the effects of such an event, this analysis identifies and characterizes the potentially affected areas and discusses potential effects on coastal resources and uses.

Failure of the Ambrey Pond Reservoir dams would, however, be expected to result in increased stream flow below the dam sites. If a failure event were large enough, downstream flooding of the floodplain, and possibly beyond, could occur as impounded waters were released. Since the Ambrey Pond Reservoir Alternative would have the same dam elevation and reservoir capacity as the reservoir project analyzed in the 1979 DEIS for the Ambrey Pond Reservoir project, this DEIS updates the identification of areas of potential downstream effect that was presented in that earlier document. That analysis utilized the USACE methodologies outlined in the publication "Dimensionless Graphs of Floods from Ruptured Dams."[1]

The 1979 analysis calculated the downstream water depth resulting from a catastrophic failure of the main dam and auxiliary dam, and mapped the dam failure floodplain. That original analysis has been updated in this DEIS to identify and characterize the types of land uses that may be affected by the unlikely failure of the Ambrey Pond Reservoir dams and the sudden release of the impounded waters. The current analysis utilized geographic information system (GIS) technology to enhance and revise the earlier analysis, and incorporates updated aerial photographs, USGS topographic map data, and Town of Stony Point tax parcel maps. This analysis enabled the identification of the number, land use characterization, and location of parcels that may be affected by complete dam failure at the reservoir.

The hydraulics of a dam-break flood wave depend on many variables, such as the size and shape of the breach, the size and shape of the reservoir, the depth of water behind the dam and the characteristics of the downstream river valley. Given the number of variables and uncertainty of prediction, the identification and characterization presented herein assumes an unlikely and not foreseeable worst-case scenario, which is that either or both the main dam and/or auxiliary dam would fail instantaneously. Despite the multitude of unpredictable variables, to simulate this occurrence, the analysis reflects the following assumptions:

- The dams and the receiving stream valley are triangularly shaped;
- Before breaching, the width of the main dam (at 316 feet elevation) is 200 feet, and the water depth behind the dam is 44 feet;
- The slope of the river valley (the Timp Mountain Brook and the Cedar Pond Brook) is 1 percent;
- The hydraulic roughness of the river valley (Manning's *n*) is 0.04; and
- Any structure which may restrict the flow in the valley will be washed out before the arrival of the maximum flood crest, therefore negating any backwater effect.

---

[1] USACE, Hydraulic Engineering Center, *Dimensionless Graphs of Floods from Ruptured Dams*, Davis, CA. January 1974 (republished April 1980 as publication RD-8; see: http://www.hec.usace.army.mil/publications/ResearchDocuments/RD-8.pdf

Figure 18C-6 depicts the area below the dams that are predicted to be affected by the maximum dam failure scenario, and highlights the floodplain areas that would potentially be affected by an instantaneous and complete failure of the dams. The figure indicates areas potentially affected by failures of each dam, and the combined area potentially affected by the unlikely event of simultaneous failure of both dams. It is important to note, however, that the likelihood of either complete or simultaneous failure is remote due to the low potential for seismic concerns, and the requirements that the dams conform to modern dam construction standards and practices. Further, it is important to recognize that a potential dam failure event encompasses a wide range of possible scenarios. However unlikely to occur, dam failure scenarios could range from minor water releases with barely detectable downstream effects, to larger events that cause temporary water surges of potentially damaging proportions.

The number and types of properties located within the potential flood area was estimated based on current aerial photos and Town of Stony Point tax parcel information. **Table 18C-7** summarizes the identification and characterization of this information. This table identifies a worst-case scenario based on the maximum area that could potentially be affected, as shown on Figure 18C-6.

Table 18C-7
Parcels Affected by Catastrophic Dam Failure

Land Use	No. of Parcels Affected		
	Main Dam Failure	Auxiliary Dam Failure	Simultaneous Dam Failure
General Business/Community Commercial	1	1	1
Institutional/Quasi-Public	10	14	14
Local Neighborhood	1	1	1
Local Park/Open Space	9	10	10
One Family Residential	135	183	193
Two Family Residential	11	13	14
Three Family Residential	6	6	6
Multi-Family Residential	3	5	5
Public Park/Open Space	5	11	11
Railroad	1	1	1
Road	1	3	3
Utilities	5	7	9
Vacant	11	15	16
Total Number of Parcels	**199**	**270**	**284**

Note: Most parcels affected by a dam break would be affected under both Main and Auxiliary Dam failures.

As discussed above, the effects of dam-related flooding would potentially affect a variety of land uses. While the narrowness of the Cedar Pond Brook valley would be expected to contain potential flood waters within the known floodplain, overflow would be expected from a larger dam failure event. It is expected that structures within the area indicated in Figure 18C-6 could experience a variety of effects, ranging from minor surficial water flows, to more severe flooding, including potential destruction of structures and property. In addition, such a failure would also potentially affect infrastructure, such as roads, power lines, telephone lines, and other utilities, including water, sewer, and gas lines.

Should a dam failure event occur, the environmental effects of a catastrophic flood event, including effects to coastal resources and uses, would be expected to include downstream deposition of sediment and transported materials, and temporary levels of increased turbidity in

floodflow waters. These effects would potentially result in the degradation and possible loss of aquatic life and habitat along the course of Cedar Pond Brook and in the immediate downstream waters of Stony Point Bay and the Hudson River. It is not anticipated that upland wildlife species would be affected, but species depending on the reservoir, Cedar Pond Brook, and the coastal wetlands and waters of Stony Point Bay for water, vegetative cover, or food, would be affected, at least temporarily. It is expected that coastal uses, such as recreational fishing and boating that may occur in Stony Point Bay and the immediate Hudson River waters, would be temporarily disrupted during a period of a dam failure event, and longer-term effects may result due to degradation of habitat or resources upon which such uses depend.

As discussed above, the probability of a catastrophic dam failure due to seismic events is expected to be minimal. As modern dam structures, it is anticipated that the Ambrey Pond Reservoir dams would be designed for the worst-case scenario and engineered to conservative standards, particularly given the presence of the Ramapo Fault. It is also expected that failure occurrences would not occur instantaneously, and that there would be forewarnings, enabling the opportunity to take mitigating actions, such as the controlled release of impounded water, and effect evacuations. Consequently, the potential for impacts on inland and coastal resources resulting from such failure is not considered to be reasonably foreseeable.

Notwithstanding the low probability of dam-related risks, United Water would develop, document, and implement an emergency action plan describing the steps to be taken in the unlikely event of a dam failure or other uncontrolled release of water.

18C.5.8. NATURAL RESOURCES

This section assesses the potential for the Ambrey Pond Reservoir Alternative to adversely affect natural resources within and in the vicinity of the Ambrey Pond Reservoir project elements. **Appendix 18C.1** provides a detailed discussion of the existing natural resources within the Ambrey Pond Reservoir study area and the potential impacts on these resources from the Ambrey Pond Reservoir Alternative. The summary of the more detailed assessment in Appendix 18C.1 follows.

18C.5.8.1. FLOODPLAINS

As shown on **Figure 18C-7**, the Ambrey Pond Reservoir Alternative would be located within the Cedar Pond Brook Watershed, and includes the following surface water features: Lake Tiorati Brook (including its continuance as Cedar Pond Brook), Timp Mountain Brook, Lower Ambrey Pond, and Upper Ambrey Pond, as shown on **Figure 18C-8**. The Ambrey Pond Reservoir and Water Treatment Plant Sites are located mostly within the 100-year floodplain area, as shown on **Figure 18C-9**. The Tiorati Brook diversion dam and a portion of the raw water transmission main that would convey diverted water to the Ambrey Pond Reservoir are also within the 100-year floodplain.

Access to construct the Ambrey Pond Reservoir Alternative and associated dams would require the development of construction roadways on United Water property and within both the 500- and 100-year floodplains. These roads would be accessed from existing public roadways, including Cedar Flats Road and Bulsontown Road. This alternative would result in the permanent inundation of the floodplain within the footprint of the Ambrey Pond Reservoir, and the inundation of some portion of the floodplain upstream of the Tiorati Brook diversion dam. Because the peak stormwater flow from the Ambrey Pond Reservoir and Tiorati Brook diversion would not be increased by the creation of the reservoir and the diversion impoundment, this alternative would not result in significant adverse impacts on the 100-year floodplain downstream of the three dams. This alternative would also result in some change to the 100-year

floodplain for Timp Mountain Brook that would have to be evaluated during the design stage. However, given the undeveloped nature of the portion of Timp Mountain Brook upstream of the proposed Ambrey Pond Reservoir, the Ambrey Pond Reservoir would not be expected to result in significant adverse impacts on the potential for public and private losses due to flood damage. Roadways lying within the inundated area would be relocated outside the 100-year floodplain.

18C.5.8.2. WETLANDS

The Ambrey Pond Reservoir Alternative site contains extensive areas of NYSDEC mapped freshwater wetlands and wetlands mapped by the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI), including about 0.6 acres of riverine wetlands, 13 acres of open water wetlands, 6 acres of emergent marsh, and 18 acres of palustrine forested shrub swamp. Most of these wetlands were a result of the two existing low dams that created the Upper and Lower Ambrey Ponds. The locations of these wetland areas are shown on **Figures 18C-10 and 18C-11**.

The inundation caused by the Ambrey Pond Reservoir Alternative would result in the permanent conversion of these wetlands to a primarily deep-water lacustrine system. Wetlands present within the footprint of the Ambrey Pond Reservoir dams, the Tiorati Brook diversion dam, and the relocated roadways would be permanently lost as well. The functions and values of these existing wetland systems would be adversely impacted. The NYSDEC wetland would be inundated, resulting in the permanent loss of vegetated wetland habitat for terrestrial wildlife (i.e., birds, mammals, reptiles, amphibians, and insects). The unavoidable adverse impacts on the approximately 38 acres of vegetated wetlands that would be lost due to reservoir construction, and any wetlands within the dam and roadway areas of disturbance, would be offset through mitigation measures developed in consultation with NYSDEC and the USACE during detailed design and permitting for this alternative.

Over time, there may be some small vegetated wetland areas created along the shorelines of the Ambrey Pond Reservoir and within the littoral zone; however the extent and persistence of these areas would likely be limited by the steep slopes found along much of the proposed reservoir bed, likely presence of conditions along the shoreline that are not conducive to the development of emergent wetland habitat (e.g., wave activity and limited shallow water habitat), and exposure of shoreline areas during drawdowns.

18C.5.8.3. WATER QUALITY

Surface waters within the Ambrey Pond Reservoir Alternative study area include Tiorati Brook, including its continuance as Cedar Pond Brook, Timp Mountain Brook, Lower Ambrey Pond and Upper Ambrey Pond. Tiorati Brook, at the point of diversion for the reservoir, is classified by NYSDEC as a Class B(T) stream. The best usages of Class B waters are for primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival. The "(T)" denotes that it is classified as a trout water. Timp Mountain Brook is also classified as a Class B(T) surface water.

The potential impact of the Ambrey Pond Reservoir on water quality is primarily attributable to the impoundment of water formed by the reservoir and the impoundment on Tiorati Brook. The increased detention time provided by the impoundments would decrease the elevated total suspended solids (TSS) concentrations and turbidity levels that occur during and after storms. Water in the reservoir may stratify due to vertical temperature gradients that may occur during late spring, summer, and early fall. The potential nutrient levels, sunlight penetration and detention time in the reservoir may promote the growth of algae in the summer.

During operation, water entering the stream reaches downstream of Ambrey Pond Reservoir and the Tiorati Brook diversion as overflow or bypass flow would be expected to reduce variation in seasonal, daily and diurnal temperature fluctuations. These modifications would have the potential to change the classification of these reaches from Class B(T) to Class B if water flowing into Tiorati Brook and Timp Mountain Brook from the diversion dam and Ambrey Pond Reservoir, respectively, has a higher temperature than existing conditions. More information on the depth of the reservoir, the depth of outflow, and the temperature profiles at critical seasons is necessary to predict downstream impacts. The possible reduction in flow and increase in temperature downstream of the Tiorati Brook diversion dam has the potential to impair this portion of the stream for its designated use—Class B(T)—and result in significant adverse impacts on the suitability of this downstream segment for trout and trout fishing. Offsets required by the NYSDEC to mitigate for the potential impairment of a portion of Tiorati Brook for its designated use as a Class B(T) water would be determined during the detailed design and permitting for this alternative.

18C.5.8.4. AQUATIC BIOTA

The existing Upper Ambrey Pond and Lower Ambrey Pond are shallow impoundments on Timp Mountain Brook that support typical warm water fish communities that are adapted to slow water. The fish communities in these ponds are likely to contain largemouth bass, bluegill sunfish, pumpkinseed sunfish, yellow perch, chain pickerel, bullheads, common shiner, and other minnow species. Virtually all of these species would be expected to occupy Ambrey Pond Reservoir.

Creation of the impoundments would displace stream-specialized fish and invertebrate species from the portions of the Ambrey Pond Reservoir area (e.g., Timp Mountain Brook), and a portion of Tiorati Brook upstream from the proposed diversion dam, that are free-flowing, resulting in the loss of individuals unable to move upstream to available suitable habitat. The loss of some individuals would not be expected to result in significant adverse impacts on regional populations of species expected to reside in the flowing portions of Timp Mountain Brook. A number of generalist species that currently exist in the system would be expected to inhabit the reservoir. Regulation of the reservoirs would have the potential to result in significant adverse impacts on individual fish inhabiting the reservoir and downstream stream segments should operation fail to maintain minimum flows within stream reaches downstream of both impoundments, and to time reservoir drawdowns outside of spawning and rearing periods (early spring through July) so as not to affect recruitment.[1] The loss of some individuals would not be expected to result in significant adverse impacts on regional populations of these generalist species, and populations of most species could likely recover after a single year of poor recruitment. However, repeated disturbance associated with low flows or low reservoir levels during spawning could result in significant adverse impacts on the fish community inhabiting the reservoir and Timp Mountain Brook below the dams.

The diversion within Tiorati Brook would consist of an earthen dam with a spillway and pool elevation of 310 feet. The withdrawal of water from the brook would change its hydrological regime below the withdrawal point, which would alter the quantity of available habitat at times during an annual cycle. A bypass flow at the diversion point would maintain stream habitat above a minimum flow. Minimum bypass flows would be between 0.3 mgd and 1.0 mgd. At times this would result in a reduction of available habitat from current conditions, but could avoid periods of extreme low flows. Tiorati Brook and its continuation as Cedar Pond Brook

[1] Recruitment is fish born into a population within an area.

often experience very low flow conditions during summer and fall. Flow in Tiorati Brook is controlled at the dam at Lake Tiorati in Harriman State Park. This release has been maintained for many years and formerly supplied water downstream to the former 1 mgd Stony Point water treatment plant operated by United Water at the site of the Cedar Brook dam.

The habitat of Tiorati Brook would be modified from the location of the diversion dam down to the Stony Point dam due to changes in flow regime. The diversion dam would reduce stream habitat by exposing the stream bed when water is being diverted to the Ambrey Pond Reservoir and stream flow is reduced. The reduction in flow and shrinking of habitats is a natural seasonal event, though the operation of the diversion has the potential to extend the periods of reduced habitat over that which will occur naturally. Habitat and fisheries survey data suggest that the primary area of brown trout spawning and nursery habitat that is of greatest value is located in the section of Tiorati Brook within Bear Mountain State Park, upstream of the location of the proposed diversion dam for water withdrawal. Habitat conditions in the stream that reach upstream of the intake are characterized as "optimal" due to the observed presence of necessary physical stream features and the presence of healthy macroinvertebrate populations, fish and amphibians. While trout are found downstream of the proposed diversion location, it appears that they are primarily migrants from upstream or stocked. Low flow conditions would affect the suitability of the portion of the stream downstream of the diversion for trout. Therefore, although the majority of trout angling occurs in the reach upstream of the diversion point, any angling that occurs downstream of the diversion would have the potential to be adversely impacted by the Ambrey Pond Reservoir Alternative. Offsets required by the NYSDEC to mitigate for the potential loss of trout habitat downstream of the diversion dam would be determined during the detailed design and permitting for this alternative.

American eel are present in both Timp Mountain Brook and Cedar Pond Brook. Although this species is not protected, it is increasingly being recognized as a species of concern. Activity that inhibits passage to upstream habitat would have the potential to adversely impact regional populations of American eel.

Construction and operation of the reservoir would have the potential to adversely impact aquatic biota in the reservoir and in Timp Mountain and Cedar Pond Brooks. The magnitude of potential impacts due to reservoir operation would vary from year to year depending on the occurrence of drought conditions and the demand for water in Rockland County. Adverse impacts would be greater in dry years than wet years.

18C.5.8.5. TERRESTRIAL RESOURCES

The Ambrey Pond Reservoir Alternative area consists of largely undeveloped lands—including upland, mixed woodlands, and wetlands—adjacent to the existing Upper and Lower Ambrey Ponds, as well as Timp Mountain Brook (see **Figure 18C-12**), that provide foraging and breeding habitat for numerous species of wildlife. Much of this habitat is contiguous with the extensive Palisades Interstate Park lands located adjacent to the Ambrey Pond Reservoir study area. The creation of Ambrey Pond Reservoir would result in unavoidable adverse impacts on the ecological communities within the Ambrey Pond Reservoir area due to inundation that would result from development of the reservoir. It would result in the permanent replacement of approximately 200 acres of existing wetland and terrestrial communities with the reservoir footprint which would be an open water habitat (see **Table 18C-8**).

Table 18C-8
Ecological Comminities within the Ambrey Pond Study Area

Ecological Community	Acres of Habitat within Study Area*	Acres of Impact
Brushy Cleared Land	5	2
Freshwater Pond/Artificial Impoundment	17	14
Mowed Lawn with Trees (Developed)	8	8
Appalachian Oak-Hickory Forest	180	73
Chestnut Oak Forest	157	10
Red Maple-Hardwood Swamp	14	13
Shrub Swamp	1	1
Skunk Cabbage Meadow	3	3
Successional Northern Hardwoods	64	64
Tussock Sedge Meadow	12	12
Riparian	1	<1
Grand Total	**462**	**200**

Note * Study area includes 316' contour reservoir footprint, 500' buffer upslope from reservoir footprint, and contiguous properties owned by United Water.

The permanent replacement of existing upland and wetland habitat with open water habitat within the Ambrey Pond Reservoir would adversely affect these resources but would not result in significant adverse impacts on regional ecological resources because these habitats are found elsewhere in upstate New York, in particular within the approximately 80-square-mile natural open space area comprising Harriman and Bear Mountain State Parks located immediately to the west of the Ambrey Pond Reservoir study area.

The diversion pipeline from the Tiorati Brook dam to the Ambrey Pond Reservoir would be constructed primarily in upland habitat within road rights-of-way, minimizing the need for additional vegetation clearing and temporary habitat loss. Within the Palisades Interstate Park, the construction of the diversion pipeline from Tiorati Brook to the reservoir would result in the clearing of trees and other vegetation within a 30-foot-wide corridor. Areas cleared of vegetation due to pipeline construction would be revegetated. Areas disturbed within the Palisades Interstate Park would be restored in accordance with the requirements of the Palisades Interstate Park Commission. Access to the easement corridor for routine maintenance would be required.

18C.5.8.6. WILDLIFE

Appendix 18C.1 provides a detailed discussion of wildlife species with the potential to occur and that were observed during visits to the Ambrey Pond Reservoir study area. The field visits were conducted during the months of May 2008 and July 2010. Existing ecological communities are represented by relatively unfragmented habitats that have been disturbed and/or modified previously. Evidence of recent disturbance includes numerous well worn all terrain vehicle (ATV) trails, evidence of hunting and fishing, and old fire pits in the vicinity of the ponds and at rocky outcrops at the higher elevations. Past disturbance and/or modification include existing impoundments and abandoned home sites. Despite past disturbance and habitat modification, the site supports a variety of wildlife including species known to occur within Harriman-Bear Mountain State Park located north and west of the Ambrey Pond Reservoir.

The Ambrey Pond Reservoir Alternative would have the potential to result in adverse impacts on terrestrial wildlife due to the reduction of habitat for wildlife species requiring upland or shallow wetland habitats for reproduction or overwintering (e.g., reptile and amphibian species) that

would be lost through the development of the reservoir, and direct loss of individual wildlife that are less mobile (e.g., small mammals, turtles, snakes, salamanders, frogs, and toads), due to collision with construction equipment, or flooding.

Since the filling of the reservoir would be a gradual process, it is likely that highly mobile wildlife individuals—such as birds, most mammals, some reptiles and amphibians—would likely move to nearby suitable habitats in response to disturbance and habitat loss in the Ambrey Pond Reservoir Alternative site, if construction activities and flooding occurred during an active period of a particular species' life cycle. However, wildlife individuals unable to find suitable habitat nearby, less mobile species, and species for which the construction or flooding occurred during a period of seasonal inactivity (e.g., during hibernation or torpor) in winter months—such as mammals present in underground burrows or snakes present in hibernacula—would be lost. Also, filling during the peak of breeding activity may impact wildlife reproduction by causing the mortality of young, mainly for species breeding close to the ground or underground. While the loss of some individuals would be adverse, it would not be expected to result in significant adverse impacts on regional populations of these species.

The creation of Ambrey Pond Reservoir would have the potential to benefit wildlife species that depend on open-water aquatic habitats. Aquatic birds such as ducks, geese, loons, cormorants and others, and certain mammals that frequent large open water habitats, such as muskrat, may benefit from the creation of open-water foraging habitat.

18C.5.8.7. RARE, SPECIAL CONCERN, THREATENED AND ENDANGERED SPECIES

Table 18C-9 presents a list of rare, special concern, threatened and endangered species identified for the Ambrey Pond Reservoir area by the New York Natural Heritage Program (NYNHP) and USFWS, identifying any of these species observed during the site visits.

The Ambrey Pond Reservoir Alternative would not be expected to result in significant adverse impacts on endangered wildlife species. No caves, mines or other rocky habitats capable of supporting Allegheny woodrats or hibernating Indiana bats are present on-site; however, targeted surveys for these species would be required to assess potential impacts of this alternative. Post-construction, the reservoir would potentially provide additional foraging and roosting habitat for the Indiana bat, and the remaining live and dead trees along and near the reservoir shoreline would also provide some potential foraging and roosting habitat.

This alternative would have the potential to impact small whorled pogonia and featherfoil populations, if any exist in the reservoir study area. Additional consultation with USFWS and NYSDEC, and possible targeted surveys for this species conducted prior to construction would be required to adequately assess potential for this alternative to impact small whorled pogonia.

The Ambrey Pond Reservoir study area is within the home range of known timber rattlesnake dens, and individuals have been observed nearby. While the Ambrey Pond Reservoir Alternative has the potential to result in the loss of possible breeding and foraging habitat for the timber rattlesnake, the loss of these areas would not be expected to result in significant adverse impacts on regional populations of this species. Suitable breeding habitat (e.g., rugged terrain in deciduous forest habitat) does not appear to be as prevalent within the project site as in adjacent state park lands. Similar foraging habitat also exists for foraging timber rattlesnakes in adjacent areas. Additional consultation with the USFWS and NYSDEC will be conducted with respect to this species prior to the initiation of any construction activities.

Table 18C-9
Federal and New York State Endangered, Threatened, and Special Concern Species With the Potential to Occur in the Ambrey Pond Reservoir Study Area

Species	Status	Comments
Mammals		
Allegheny Woodrat	NY-Endangered	Identified in 2008 NYNHP file search. No potential on-site habitat; not expected to occur on site; probably extirpated from this area of New York State
Indiana Bat	Federal and NY-Endangered	The 2008 and 2010 New York NHP file search did not indicate the Indiana bat was documented in this area; the USFWS lists the Indiana bat as known to occur in Rockland County.
Small-footed Bat	NY-Special Concern	Potential Foraging Habitat Present – No Hibernacula Present
Birds		
Cerulean Warbler	NY-Special Concern	Potential Nesting – Identified during 1980-1985 Breeding Bird Atlas/Visitor during Migration-Foraging
Red-shouldered Hawk	NY-Special Concern	Potential Nesting – Identified during 1980-1985 Breeding Bird Atlas/Occasional Visitor - Foraging
Cooper's Hawk	NY-Special Concern	Potential Nesting/Occasional Visitor - Foraging
Sharp-shinned Hawk	NY-Special Concern	Identified on Site during the preparation of the 1979 DEIS - Potential nesting/Occasional Visitor - Foraging
Whip-poor-will	NY-Special Concern	Potential Nesting – Identified during 2000-2005 Breeding Bird Atlas/Occasional Visitor - Foraging
Golden-winged Warbler	NY-Special Concern	Potential Nesting – Identified during 1980-1985 Breeding Bird Atlas/Occasional Visitor - Foraging
Reptiles and Amphibians		
Timber Rattlesnake*	NY-Threatened	Identified in 2010 New York NHP File Search
Spotted Turtle*	NY-Special Concern	Identified on Site during the 2010 site visit
Bog Turtle	Federal – Threatened NY - Endangered	USFWS lists this species as known to occur in Rockland County.
Wood Turtle*	NY-Special Concern	Not Identified on Site - Potential Habitat Present
Eastern Box Turtle*	NY-Special Concern	Identified on site during the preparation of the 1979 DEIS - Potential Habitat Present
Eastern Worm Snake*	NY-Special Concern	Not Identified on Site - Potential Habitat Present
Eastern Hog-nosed Snake*	NY-Special Concern	Not Identified on Site - Potential Habitat Present
Jefferson Salamander*	NY-Special Concern	Not Identified on Site - Potential Habitat Present
Blue-spotted Salamander*	NY-Special Concern	Not Identified on Site -Potential Habitat Present
Marbled Salamander*	NY-Special Concern	Present during 2008 Site Visit - Confirmed Breeding – Identified in Thiells and Popolopen Lake USGS Map Area During 1990 – 2000 Herp Atlas Program
Southern Leopard Frog*	NY-Special Concern	Not Identified on Site - Potential Habitat Present
Plants		
Small whorled Pogonia	Federal – Threatened NY - Historical	USFWS lists this species as potentially occurring in Rockland County. Habitat is potentially present within the project site.
Featherfoil (Hottonia inflata)	NY-Threatened	NYNHP lists this species as occurring in Rockland County. Habitat is potentially present within the project site.

Note: * Identified in Thiells and/or Popolopen Lake USGS Quadrangle Map Area during the 1990 – 2000 Herp Atlas Program

Sources: NYNHP Letter, USFWS Website – Listed Species By County as of July 2010

Suitable habitat for several special concern species exists within the study area. Forest habitat supporting Cooper's and sharp-shinned hawks, and cerulean and golden-winged warblers is present, and heterogeneous forest-wetland habitat assemblages required by spotted, wood and eastern box turtles, eastern hog-nosed and eastern wood snakes, marbled, Jefferson, and blue-spotted salamanders, and southern leopard frog suggest that each species has the potential to be present within upland and marsh habitats. Flooding would remove habitats required by these species for reproduction and foraging, resulting in direct mortality of individuals, and has the potential to result in increased predation of amphibian larvae and adults by open-water fish species (i.e., bass, pickerel).

As noted above, many of the mammal and bird species of special concern are mobile and would be expected emigrate to suitable habitats available nearby, particularly within the nearby Harriman-Bear Mountain State Parks, if the reservoir were to be flooded incrementally as planned. The loss of some individuals of these species unable to find suitable available habitat nearby would not be expected to result in significant adverse impacts on populations of these species. However, the Ambrey Pond Reservoir Alternative has the potential to result in unavoidable adverse impacts on less mobile reptile and amphibian species of special concern discussed above. Additional consultation with NYSDEC would be conducted with respect to these species prior to the initiation of any construction activities.

18C.5.9. HAZARDOUS MATERIALS

There are three primary concerns regarding hazardous materials associated with the Ambrey Pond Reservoir Alternative sites. These concerns include existing land uses and fuel oil storage tanks or septic systems and leach fields associated with those uses; potential spills of fuel and chemicals during construction; and storage of chemicals on-site during operation.

Any fuel oil storage tanks associated with residences to be demolished during construction of the reservoir would be removed from the site and disposed of in accordance with all applicable regulations. On-site residential septic systems would be inspected for the presence of sewage in septic tanks and any remaining wastewater would be pumped out by a licensed contractor prior to reservoir construction. Prior to demolition, each structure would be assessed for the presence of hazardous materials—such as household chemicals, fertilizers, or pesticides—as well as for the presence of asbestos. Any such materials would be removed and disposed of in accordance with applicable regulations.

During construction, chemical bulk storage, and petroleum bulk storage may be stored on-site. Heavy machinery operation will include on-site refueling and possible temporary storage of diesel and gasoline fuel as well as automotive fluids and grease. Incidental or accidental chemical and or petroleum spills may occur during maintenance of these vehicles during construction. Storage of any such materials would occur in accordance with all applicable regulations, and any release or spill would be contained and remediated in accordance with all applicable regulations.

The Ambrey Pond Reservoir Alternative would use a variety of chemicals and petroleum products and would generate residual solids and liquids in the water treatment (e.g., filtration and disinfection) process, the storage, use, and disposal of these are subject to strict regulation and, as such, would not be expected to present the potential for significant adverse impacts during operation of either treatment facility. As with the Proposed Project, any potential contaminants and bulk storage facilities create a contamination concern. However, with the implementation of a variety of measures, no significant adverse impacts related to hazardous

materials would be expected to occur as a result of the construction or operations of the Ambrey Pond Reservoir Alternative.

18C.5.10. INFRASTRUCTURE AND ENERGY

The Ambrey Pond Reservoir Alternative's new facilities would be connected to the utilities serving this alternative's general area, including potable water mains, sanitary sewers, and the natural gas supply and electric grid. These services would provide the alternative's buildings and facilities with their basic utility needs

18C.5.10.1. SANITARY SEWAGE FACILITIES

Sanitary sewer service in the Town of Stony Point comprises both individual septic systems and municipal sanitary sewers. Residences and other uses within the Ambrey Pond Reservoir Alternative area do not appear to have connections to the town's sanitary sewer system and are expected to rely on individual septic systems as the means for sewage treatment and disposal. As the ability to connect to the town's sewerage facilities does not exist at the Water Treatment Plant Site, this alternative would therefore not significantly impact the existing treatment facilities.

18C.5.10.2. WATER SUPPLY

Once in operation, this alternative is anticipated to have minimal demands on the water distribution system. Anticipated demand on potable water is expected to be primarily for miscellaneous usage at the water treatment plant. This alternative would, however, create a new long-term water supply source that would supplement existing water supply sources within United Water's Rockland County service area.

18C.5.10.3. STORMWATER

Stormwater control in the area of the Ambrey Pond Reservoir Alternative area is composed of an intricate network of ditches and swales located along the side of local roads to control runoff. These existing drainage facilities discharge into local streams that ultimately flow into the Hudson River. Aside from stormwater runoff that may flow into the reservoir, stormwater would continue to discharge into the existing drainage system of local streams that ultimately flow into the Hudson River.

The existing impervious surface area on this alternative's sites is approximately 30,000 square feet. Under this alternative, the total impervious surface area of the affected sites would increase to approximately 100,000 square feet. It would be expected that a stormwater management plan incorporating best management practices would be developed in accordance with the New York State *Stormwater Management Design Manual*. As a result, it is not expected that the peak stormwater flow from the site would be increased by this alternative.

18C.5.10.4. ELECTRIC AND TELEPHONE

An electrical transmission line belonging to Orange and Rockland Utilities, Inc. (O&R) traverses the southern portion of the expanded reservoir site. A portion of an existing access road along this utility line right of way would be inundated by the reservoir and relocation would be likely. Coordination with O&R officials would be necessary to determine any potential effects to this transmission line, and to undertake any necessary utility relocation.

The anticipated energy consumption of the Ambrey Pond Reservoir Alternative would largely involve the operation of a pump station to lift diverted water from the Tiorati Brook diversion to

the discharge at the Ambrey Pond Reservoir auxiliary dam, a low-lift pump to convey raw water from the reservoir to the treatment plant, and the operation of the water treatment plant. It is estimated that 5,548 MWh/year of electrical service would be required during the operational period of this alternative.

18C.5.10.5. NATURAL GAS

The Algonquin Gas Line (Duke Energy) lies near the southern border of the reservoir area. This gas line would not be affected by this alternative. As discussed above, in section 18C.3.2.1, "Land Acquisition Requirements," a portion of the Duke Energy property in the vicinity of the Ambrey Pond Reservoir auxiliary dam would need to be acquired for dam construction and related purposes. It is not expected that this acquisition would affect the use of this property by its current owner.

Therefore, like the Proposed Project, the Ambrey Pond Reservoir Alternative would not result in significant adverse impacts on infrastructure supply or demand.

18C.5.11. TRAFFIC AND TRANSPORTATION

The Ambrey Pond Reservoir Alternative is not expected to generate a significant volume of site-generated traffic once operational. As discussed above, the Ambrey Pond Reservoir Alternative, upon completion, would employ no more than 10 full-time positions, and would therefore generate fewer than 10 employee trips in each peak hour on a daily basis, with occasional visitors and deliveries. Greater traffic impacts are anticipated during the construction of the reservoir. On this basis, this analysis provides an assessment and capacity analysis of the temporary traffic impacts generated due to the anticipated construction process.

For this analysis, an analysis year of 2014 was used. This is assumed to be the likely peak year of construction activity for this alternative. The methodologies followed in this construction traffic analysis are discussed in section 15.3.10 of Chapter 15, "Construction Impacts."

18C.5.11.1. CONSTRUCTION PERIOD TRAFFIC

During construction of the Ambrey Pond Reservoir Alternative, construction-related traffic would be added to the local roadways. As described earlier in this chapter, construction would occur at the main and auxiliary dam sites, including the adjacent Water Treatment Plant Site, at the same time. This section of the chapter describes the construction-related traffic and its anticipated effects during the construction of the Ambrey Pond Reservoir.

Table 18C-10, below, summarizes the projected site-generated traffic for the anticipated construction efforts. Typically, construction workers are on-site before the regular commuter peak hour and frequently work a 7 AM to 4 PM shift; however, in an effort to be conservative, this analysis assumes that all workers would arrive during the early morning peak hour (7 AM to 8 AM), and depart during the afternoon peak hour (5 PM to 6 PM). No construction activity would be anticipated during the weekend periods.

Project site-generated traffic for the construction period during the AM and PM peak hours would be approximately 146 trips. Distribution patterns for the proposed development are based on an evaluation of current traffic patterns in the immediate vicinity of the Ambrey Pond Reservoir sites. Based on this evaluation, it is estimated that approximately 65 percent of the total truck site-generated traffic would have an origin/destination to the south, via U.S. Route 9W, and 35 percent arriving/departing to the north, via U.S. Route 9W. Similarly, approximately 45 percent of the total construction worker site-generated traffic would have an origin/ destination to the south via U.S.

Route 9W, 25 percent arriving/departing to the north via U.S. Route 9W, 20 percent arriving/departing via the Palisades Parkway, and 10 percent utilizing local roadways. It is anticipated that all commercial truck and heavy vehicle traffic would be directed to avoid local roadways and follow designated truck routes such as U.S. Route 9W and County Route 106.

Table 18C-10
Site-Generated Construction Traffic Projections

Item	Phase 1	Phase 2	Phase 3
Schedule	900 days	450 days	720 days
Delivery Truck	52 per day (32 per day avg.)	3 per day (1 per day avg.)	13 per day (8 per day avg.)
Concrete Truck	48 per day max. (22 per day avg.)	4 per day max. (1 per day avg.)	5 per day max. (3 per day avg.)
Dump Truck	42 loads per day (22 per day avg.)	2 loads per day (1 per day avg.)	31 loads per day (9 per day avg.)
Total Truck Trips	142 per day	9 per day	49 per day
Peak Hour Trips – One-way	28 trucks peak hour	2 trucks peak hour	10 trucks peak hour
Peak Hour Truck Trips - Roundtrip	56 trucks peak hour	4 trucks peak hour	20 trucks peak hour
Construction Worker Trips	90 worker peak hour	15 worker peak hour	20 worker peak hour
Total Trips	**146 trips**	**19 trips**	**40 trips**

A capacity analysis was conducted to assess the impacts associated with construction of the Ambrey Pond Reservoir Alternative. The analysis was conducted for the weekday morning and afternoon (AM and PM, respectively) peak hours to assess project-related traffic impacts at the study area intersections.

The 2010 existing, 2014 No Build, and 2014 Build capacity analyses are presented in **Tables 18C-11 and 18C-12** for the study area's signalized and unsignalized intersections, respectively.

18C.5.11.2. SUMMARY OF CONSTRUCTION PERIOD TRAFFIC IMPACTS AND MITIGATION

The following is a summary of the potential temporary significant adverse impacts associated with construction during the 2014 Build condition. All increases in delay described below are given in comparison to the 2014 No Build condition.

Table 18C-11
LOS Summary for Signalized Intersections

Intersection Approach	Lane Group	AM Peak Hour						PM Peak Hour					
		Existing		No Build		Build		Existing		No Build		Build	
		Delay (SPV)	LOS	Delay (SPV)	LOS	Delay (SPV)	LOS	Delay (SPV)	LOS	Delay (SPV)	LOS	Delay (SPV)	LOS
Route 202/Westside Avenue & Route 9W/202													
Route 202 (EB)	LT	22.4	C	23.9	C	25.6	C	23.6	C	25.2	C	26.6	C
	R	6.5	A	6.4	A	6.4	A	7.5	A	10.0	A	12.1	B
Westside Ave (WB)	LTR	10.8	B	11.7	B	12.0	B	25.3	C	26.9	C	27.9	C
Rt 9W (NB)	L	7.2	A	8.3	A	8.8	A	14.3	B	21.0	C	30.0	C
	TR	12.7	B	13.5	B	14.4	B	17.4	B	18.9	B	19.0	B
Rt 9W/202 (SB)	L	5.0	A	5.5	A	5.8	A	5.3	A	5.8	A	5.8	A
	TR	18.0	B	18.9	B	19.3	B	21.7	C	23.7	C	27.0	C
Intersection Summary		12.5	B	13.3	B	14.0	B	17.3	B	19.7	B	22.3	C
Railroad Avenue & Route 9W/202													
Railroad Ave (EB)	L	29.9	C	30.4	C	31.3	C	30.4	C	30.8	C	30.8	C
	TR	47.0	D	47.3	D	47.3	D	114.9	F	130.6	F	130.6	F
Railroad Ave (WB)	L	30.8	C	32.2	C	32.0	C	48.5	D	51.1	D	51.1	D
	TR	105.3	F	117.2	F	117.2	F	74.7	E	83.7	F	83.7	F
Rt 9W/202 (NB)	L	18.4	B	19.9	B	21.2	C	34.8	C	43.8	D	**69.4**	**E**
	T	37.9	D	41.7	D	**56.8**	**E**	28.7	C	30.1	C	31.1	C
	R	18.6	B	18.8	B	18.9	B	21.1	C	21.5	C	21.5	C
Rt 9W/202 (SB)	L	20.7	C	23.4	C	30.4	C	21.5	C	24.2	C	25.9	C
	T	24.3	C	25.0	C	26.0	C	27.2	C	28.4	C	31.6	C
	R	18.0	B	18.0	B	18.1	B	19.0	B	19.1	B	19.2	B
Intersection Summary		44.3	D	47.9	D	51.8	D	52.5	D	58.2	E	60.4	E
Filors Lane & Route 9W/202													
Filors Ln (EB)	LT	47.2	D	49.9	D	49.9	D	48.8	D	51.6	D	51.6	D
	R	7.5	A	7.5	A	7.5	A	7.7	A	7.6	A	7.6	A
Shopping Cntr Drwy (WB)	LTR	16.1	B	16.2	B	16.2	B	31.2	C	33.4	C	33.4	C
Rt 9W/202 (NB)	L	6.4	A	7.3	A	7.7	A	4.4	A	4.6	A	4.8	A
	TR	10.0	B	11.0	B	13.2	B	9.9	A	10.5	B	10.8	B
Rt 9W/202 (SB)	L	3.4	A	3.5	A	3.5	A	3.6	A	3.7	A	3.7	A
	TR	14.8	B	16.2	B	17.3	B	11.1	B	11.7	B	13.1	B
Intersection Summary		14.7	B	15.8	B	16.9	B	15.4	B	16.2	B	16.5	B
Central Drive & Route 9W/202													
Central Dr (EB)	L	20.5	C	21.2	C	21.5	C	32.9	C	34.4	C	34.7	C
	TR	7.3	A	7.4	A	7.3	A	6.4	A	6.2	A	6.1	A
Shopping Cntr Drwy (WB)	LTR	12.8	B	13.1	B	13.1	B	10.0	A	9.9	A	9.9	A
Rt 9W/202 (NB)	L	6.1	A	6.4	A	6.8	A	14.3	B	15.9	B	19.2	B
	TR	11.0	B	12.0	B	13.9	B	27.2	C	29.9	C	31.1	C
Rt 9W/202 (SB)	L	4.9	A	4.9	A	5.0	A	11.5	B	12.0	B	12.0	B
	T	15.6	B	16.2	B	18.1	B	30.6	C	33.6	C	43.4	D
	R	3.1	A	3.5	A	3.8	A	5.4	A	6.0	A	7.5	A
Intersection Summary		11.0	B	11.7	B	12.9	B	23.1	C	25.0	C	28.2	C
Main Street & Route 9W/202													
Main St (EB)	LTR	21.8	C	22.4	C	23.9	C	20.4	C	20.6	C	26.7	C
Main St (WB)	L	37.7	D	39.8	D	43.3	D	43.0	D	46.7	D	**67.2**	**E**
	TR	14.1	B	14.0	B	13.9	B	15.2	B	15.1	B	14.9	B
Rt 9W/202 (EB)	LTR	13.4	B	15.3	B	27.8	C	13.8	B	16.0	B	19.3	B
Rt 9W/202 (WB)	LTR	7.8	A	8.1	A	8.6	A	8.1	A	8.5	A	9.0	A
Intersection Summary		14.5	B	15.7	B	21.9	C	15.6	B	17.1	B	21.5	C

Table 18C-12
LOS Summary for Unsignalized Intersections

Intersection Approach	Lane Group	AM Peak Hour						PM Peak Hour					
		Existing		No Build		Build		Existing		No Build		Build	
		Delay (SPV)	LOS	Delay (SPV)	LOS	Delay (SPV)	LOS	Delay (SPV)	LOS	Delay (SPV)	LOS	Delay (SPV)	LOS
Washburns Lane & Route 9W/202													
Washburns Ln (EB)	LTR	34.0	D	40.3	E	49.2	E	17.5	C	18.5	C	19.6	C
Bank Drwy (WB)	LTR	21.8	C	23.2	C	25.0	D	18.2	C	19.2	C	20.4	C
Rt 9W/202 (NB)	L	9.6	A	9.8	A	9.9	A	8.7	A	8.8	A	9.0	A
	TR	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Rt 9W/202 (SB)	L	9.9	A	10.2	B	10.6	B	9.1	A	9.2	A	9.3	A
	TR	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Intersection Summary*		3.4	A	4.0	A	4.5	B	1.8	A	1.9	A	1.8	A
Central Drive & Reservoir Road/Thiells Road													
Central Dr (EB)	LT	1.0	A	1.0	A	1.5	A	1.7	A	1.8	A	1.8	A
	R	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Central Dr (WB)	LT	1.8	A	1.9	A	1.9	A	1.8	A	1.8	A	1.8	A
	TR	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Thiells Rd (NB)	LTR	96.6	F	135.2	F	182.2	F	95.7	F	135.2	F	154.9	F
Reservoir Rd (SB)	LTR	19.4	C	21.0	C	22.9	C	29.2	D	33.9	D	33.6	D
Intersection Summary*		20.1	B	27.0	B	34.8	B	18.6	B	25.1	B	27.9	B
Central Drive & Main Street/Pyngyp Road													
Central Dr (EB)	LT	1.4	A	1.5	A	1.6	A	4.1	A	4.3	A	4.4	A
	R	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Central Dr (WB)	LT	0.6	A	0.6	A	0.6	A	3.2	A	3.3	A	3.2	A
	TR	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Pyngyp Road (NB)	LTR	16.4	C	17.1	C	17.7	C	31.2	D	35.0	D	**36.5**	**E**
Main St (SB)	LTR	16.0	C	17.3	C	20.3	C	182.0	F	269.0	F	353.8	F
Intersection Summary*		3.6	A	3.9	B	4.4	B	25.3	B	35.7	C	47.7	C
Central Drive & Cedar Flats Road													
Central Dr (EB)	LT	2.3	A	2.3	A	2.3	A	2.2	A	2.3	A	2.3	A
	T	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Central Dr (WB)	T	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
	R	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Cedar Flats Rd (SB)	LR	18.1	C	19.1	C	19.5	C	13.9	B	14.4	B	14.5	B
Intersection Summary*		1.6	A	1.6	A	1.6	A	1.3	A	1.4	A	1.4	A
Palisades Parkway NB Entrance & Cedar Flats Road													
Cedar Flats Rd (NB)	LT	4.9	A	5.0	A	5.0	A	4.7	A	4.8	A	5.0	A
Cedar Flats Rd (SB)	TR	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Intersection Summary*		3.2	A	3.2	A	3.2	A	3.5	A	3.6	A	3.8	A
Mott Farm Road & Bulsontown Road/Queensboro Road													
Mott Farm Rd (WB)	LR	9.4	A	9.5	A	9.5	A	9.0	A	9.1	A	9.1	A
Bulsontown Rd (NB)	TR	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Queensboro Rd (SB)	LT	5.0	A	5.1	A	5.1	A	4.9	A	5.0	A	5.0	A
Intersection Summary*		6.4	A	6.5	A	6.6	A	4.8	A	4.9	A	4.8	A
Site Driveway & Bulsontown Road													
Site Drwy (EB)	LR	0.0	A	0.0	A	8.6	A	0.0	A	0.0	A	8.6	A
Bulsontown Rd (NB)	LT	0.0	A	0.0	A	4.0	A	0.0	A	0.0	A	1.0	A
Bulsontown Rd (SB)	TR	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Intersection Summary*		0.0	A	0.0	A	2.2	A	0.0	A	0.0	A	2.5	A
Site Driveway & Main Street													
Main St (EB)	TR	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
Main St (WB)	LT	0.0	A	0.0	A	2.9	A	0.0	A	0.0	A	1.4	A
Site Drwy (NB)	LR	0.0	A	0.0	A	8.9	A	0.0	A	0.0	A	10.3	B
Intersection Summary*		0.0	A	0.0	A	2.4	A	0.0	A	0.0	A	2.9	A

*ICU Level of Service shown for two-way stop controlled intersections

18C.5.11.2.1. Potential Temporary Significant Adverse Traffic Impacts Occurring at Signalized Intersections

The analysis results show that 1 intersection would be impacted during the AM peak hour and 3 intersections would be impacted during the PM peak hour. The locations where these temporary significant adverse impacts would occur are described below and shown on Table 18C-10.

AM Peak Hour

- *Railroad Avenue and Route 9W/202*: The northbound Route 9W/202 through movement of this intersection would be adversely impacted, with the movement delay increasing from 41.7 seconds (LOS D) to 56.8 seconds (LOS E).

PM Peak Hour

- *Railroad Avenue and Route 9W/202*: The northbound Route 9W/202 left turn movement of this intersection would be adversely impacted, with the movement delay increasing from 43.8 seconds (LOS D) to 69.4 seconds (LOS E).
- *Main Street and Route 9W/202*: The westbound Main Street left turn movement of this intersection would be adversely impacted, with the movement delay increasing from 46.7 seconds (LOS D) to 67.2 seconds (LOS E).

18C.5.11.2.2. Potential Temporary Significant Adverse Traffic Impacts Occurring at Unsignalized Intersections

Applying the traffic impact criteria, described above, to the analysis results shows that there would be a total of 1 potential temporary significant adverse impact at unsignalized intersections in the study area under the 2014 Build condition which would occur during the AM peak hour. The location where this temporary significant adverse impact would be expected to occur is described below as shown on **Table 18C-12**.

AM Peak

- *Central Drive and Main Street/Pyngyp Road*: The northbound Pyngyp Road approach of this intersection would be adversely impacted, with the delay of this approach increasing from 35.0 seconds (LOS D) to 36.5 seconds (LOS E).

Although these impacts at signalized and unsignalized intersections would not be permanent because they are construction-related, measures have been identified that would mitigate these construction-related potential temporary significant adverse traffic impacts. A description of the measures, and an analysis showing the resulting effects of implementing the measures suggested as mitigation for these impacts, are discussed below. All of the mitigation measures suggested would serve to eliminate the predicted temporary significant adverse impacts of this alternative.

Mitigation measures have been developed to address the potential temporary significant adverse traffic impacts that could result from that additional project-related traffic that would be generated from construction. The potential impacts identified at signalized (2 intersections) and unsignalized (1 intersection) intersections within this alternative's study area could be mitigated through the use of standard traffic management techniques, including signal retiming (shifting of green time, or developing new signal phasing plans), or the implementation of Maintenance and Protection of Traffic (MPT) plans.

Table 18C-13 shows the results of the capacity analyses and compares the 2010 existing, 2014 No Build, Build, and Build with Mitigation conditions for the AM peak hour. Similarly, **Table 18C-14**

shows the results of the capacity analyses and compares the 2010 existing, 2014 No Build, Build, and Build with Mitigation conditions for the PM peak hour. Tables 18C-13 and 18C-14 also provide a brief description of the mitigation measures proposed at the various impact locations.

Table 18C-13
Mitigation LOS Summary for Study Area Intersections AM Peak Hour

Intersection Approach	Lane Group	AM Peak Hour Existing Delay (SPV)	Existing LOS	No Build Delay (SPV)	No Build LOS	Build Delay (SPV)	Build LOS	Build with Mitigation Delay (SPV)	Build with Mitigation LOS	Mitigation Measures
Railroad Avenue & Route 9W/202 (Signalized)										
Railroad Ave (EB)	L	29.9	C	30.4	C	31.3	C	33.4	C	
	TR	47.0	D	47.3	D	47.3	D	47.3	D	
Railroad Ave (WB)	L	30.8	C	32.2	C	32.0	C	33.8	C	
	TR	105.3	F	117.2	F	117.2	F	117.2	F	Shift 3 seconds of green time from the EB/WB left turn phase to the NB/SB phase
Rt 9W/202 (NB)	L	18.4	B	19.9	B	21.2	C	19.6	B	
	T	37.9	D	41.7	D	**56.8**	**E**	52.3	D	
	R	18.6	B	18.8	B	18.9	B	18.0	B	
Rt 9W/202 (SB)	L	20.7	C	23.4	C	30.4	C	27.5	C	
	T	24.3	C	25.0	C	26.0	C	24.8	C	
	R	18.0	B	18.0	B	18.1	B	17.2	B	
Intersection Summary		44.3	D	47.9	D	51.8	D	50.4	D	

Table 18C-14
Mitigation LOS Summary for Study Area Intersections PM Peak Hour

Intersection Approach	Lane Group	PM Peak Hour Existing Delay (SPV)	Existing LOS	No Build Delay (SPV)	No Build LOS	Build Delay (SPV)	Build LOS	Build with Mitigation Delay (SPV)	Build with Mitigation LOS	Mitigation Measures
Railroad Avenue & Route 9W/202 (Signalized)										
Railroad Ave (EB)	L	30.4	C	30.8	C	30.8	C	30.8	C	
	TR	114.9	F	130.6	F	130.6	F	130.6	F	
Railroad Ave (WB)	L	48.5	D	51.1	D	51.1	D	51.1	D	
	TR	74.7	E	83.7	F	83.7	F	83.7	F	
Rt 9W/202 (NB)	L	34.8	C	43.8	D	**69.4**	**E**	52.8	D	New signal phasing plan – incorporate SB lead phase and NB lag phase.
	T	28.7	C	30.1	C	31.1	C	32.0	C	
	R	21.1	C	21.5	C	21.5	C	21.7	C	
Rt 9W/202 (SB)	L	21.5	C	24.2	C	25.9	C	38.9	D	
	T	27.2	C	28.4	C	31.6	C	31.6	C	
	R	19.0	B	19.1	B	19.2	B	19.2	B	
Intersection Summary		52.5	D	58.2	E	60.4	E	59.6	E	
Main Street & Route 9W/202 (Signalized)										
Main St (EB)	LTR	20.1	C	20.6	C	26.7	C	23.8	C	
Main St (WB)	L	43.0	D	46.7	D	**67.2**	**E**	53.7	D	Shift 2 seconds of green time from NB/SB phase to EB/WB phase
	TR	15.2	B	15.1	B	14.9	B	13.8	B	
Rt 9W/202 (EB)	LTR	13.8	B	16.0	B	19.3	B	21.7	C	
Rt 9W/202 (WB)	LTR	8.1	A	8.5	A	9.0	A	9.9	A	
Intersection Summary		15.6	B	17.1	B	21.5	C	21.2	C	
Central Drive & Main Street/Pyngyp Road (Unsignalized)										MPT Plan (Either a police officer or flagger with the appropriate signage directing traffic to create sufficient traffic gaps for Pyngyp Road traffic). This measure would only need to be implemented if required by the approving government agency during the Construction AM peak hour.
Central Dr (EB)	LT	4.1	A	4.3	A	4.4	A	4.4	A	
	R	0.0	A	0.0	A	0.0	A	0.0	A	
Central Dr (WB)	LT	3.2	A	3.3	A	3.2	A	3.2	A	
	TR	0.0	A	0.0	A	0.0	A	0.0	A	
Pyngyp Road (NB)	LTR	31.2	D	35.0	D	**36.5**	**E**	28.8	D	
Main St (SB)	LTR	182.0	F	269.0	F	353.8	F	326.8	F	
Intersection Summary*		25.3	B	35.7	C	47.7	C	44.0	C	

Note: * ICU Level of Service shown for two-way stop controlled intersections

With minor signal retiming/rephrasing implemented at the above signalized intersections, acceptable levels of service could be maintained at each signalized intersection during the construction period. Synchro results are typically conservative, and LOS E is not uncommon at unsignalized intersections during peak hour conditions. However, with signage and a MPT plan implemented to create sufficient gaps for Pyngyp Road traffic (either police officers or flaggers to direct traffic if needed), acceptable levels of service could be maintained at each unsignalized intersection during the construction period. Construction traffic would, however, vary over time as different aspects of construction occur, and, therefore, these conditions are expected to be temporary in duration during the overall construction period. MPT plan measures would be implemented as needed for any partial temporary road closures that are necessary during construction activities.

18C.5.11.3. OPERATIONAL PERIOD

The Ambrey Pond Reservoir Alternative would not generate a significant volume of traffic once the site is operational. Once operational, preliminary estimates indicate the water treatment plant would generate fewer than 10 trips on a daily basis, with occasional visitors and deliveries. Due to this low volume of site-generated traffic, this alternative is not expected to create a significant impact on traffic conditions on the local roadways during the operation phase.

As discussed in section 18C.3.3, above, construction of the Ambrey Pond Reservoir Alternative would require the permanent relocation of portions of Cedar Flats Road and Bulsontown Road onto undeveloped lands adjacent to the reservoir. These realignments are not expected to cause an increase in traffic delays.

Because the Ambrey Pond water treatment plant would have a minimal number of employees, no adverse significant impacts on public transportation are anticipated during the operation phase. Therefore, like the Proposed Project, the Ambrey Pond Reservoir Alternative would not result in significant adverse traffic impacts once operational.

18C.5.12. NOISE

Temporary noise impacts on sensitive receptors are predicted to occur due to a significant increase in noise levels during construction of the reservoir and water treatment plant, especially during peak construction periods. The operation of this alternative is expected to result in minor increases in noise levels mainly due to the operation of roof top ventilation systems for the new buildings. However, each of these facilities would be designed to be in compliance with any applicable Town of Stony Point noise codes.

Therefore, like the Proposed Project, the Ambrey Pond Reservoir Alternative would not result in significant adverse noise impacts.

18C.5.13. AIR QUALITY

The operation of the Ambrey Pond Reservoir Alternative would result in a minor increase in stationary source air emissions. Air emissions generated by the operation of the alternative would mainly consist of trucks delivering chemicals and other materials, trucks removing sludge from the Water Treatment Plant Site, and a small number of employee and visitor vehicles. Emergency generators would occasionally create some minor point source emissions, but these would occur over very short durations for periodic testing purposes, or in the event of a power disruption. However, these activities are not expected to have a measurable impact on air quality in the local area or in the region.

Therefore, like the Proposed Project, the Ambrey Pond Reservoir Alternative would not result in significant adverse air quality impacts.

18C.5.14. GLOBAL CLIMATE CHANGE

The consequences of the Ambrey Pond Reservoir Alternative, with respect to greenhouse gas emissions, are reviewed below.

The greenhouse gas emissions projected to result from this alternative include emissions associated with construction, embedded emissions associated with the extraction, production, and transport of materials—especially cement and steel, and emissions associated with building heating and electricity consumption. The estimated emissions are presented in **Table 18C-15.**

Table 18C-15
Comparison of GHG Emissions and Energy Efficiency
Ambrey Pond Reservoir Alternative vs. Proposed Project

Component	Ambrey Pond Reservoir Alternative	Proposed Project
Average Annual GHG Emissions (metric tons CO_2e)		
On-site Fuel Use for Heating	126	165
Process Electricity[1]	1,944	6,397
Embodied Buildings[2]	44	58
Embodied Materials and Systems[2]	242	109
Construction Trips[3]	92	92
Annualized Deforestation	246 to 618	N/A
Total	***2,694 to 3,066***	***6,821***
Energy Efficiency (kWh/Mgal)		
Process electricity demand per unit water produced	2,178	7,166

Notes:
1. Based on Phase 3 electricity use.
2. Embodied emissions would occur over a period prior to and during construction and are annualized over the 50 years.
3. The emissions presented are annualized over 50 years. Construction and embodied emissions would occur during the construction period only. Total construction and embodied emissions would be 18,933 metric tons CO_2e.

The largest contribution to the alternative's carbon footprint would be electricity use. Other major contributors to greenhouse gas emissions under this alternative would be the production of concrete used during construction of the main dam, as well as materials used in the construction of the filtration plant. In comparison to the Proposed Project, which does not include any dam components, the Ambrey Pond Reservoir Alternative's water treatment plant would require a smaller building than the Proposed Project because this alternative would not include a reverse osmosis filtration stage and associated building space. As a result, it is expected that the greenhouse gas emissions associated with the construction of this alternative's filtration plant building would be less than the emissions resulting from the Proposed Project filtration plant's construction. Overall, this alternative would use more concrete than the Proposed Project, and in

total would emit approximately 70 percent more CO_2e as a result of the energy embodied in materials.

Plant operations would have an associated direct and ongoing energy demand; however, this would be considerably less than the energy required for the Proposed Project. Upon completion of the 2 billion gallon reservoir and the treatment plant producing 7.5 mgd of potable water, this alternative would create an energy demand of approximately 5,600 MWh/year, averaging approximately 2,000 kWh per million gallons of potable water produced. At this rate, the operational energy consumption and resultant greenhouse gas emissions would be equivalent to 30 percent of those generated by the Proposed Project, resulting in annual emissions of approximately 2,000 metric tons of CO_2e (assuming no use of on-site renewable energy or other offsets).

Overall, the annualized emissions (50-year average, including construction) are estimated at approximately 2,400 metric ton CO_2e per year—approximately 36 percent of those expected for the Proposed Project. However, as described above, the Ambrey Pond alternative would require the inundation of a substantial amount forested area. Appalachian oak-hickory forest contains 90 to 226 tons of carbon per hectare (the range represents the 50th to 99th percentile, depending on density of the forest).[1] Once removed, these trees would degrade and release the carbon as CO_2, ranging from 12,300 to 30,900 tons of CO_2, assuming that 40 percent would remain in landfill after 100 years, or up to 51,500 tons of CO2 if not landfilled. This is equivalent to 246 to 618 tons of CO_2 per year, on a 50-year lifetime basis (the assumed project lifetime). This assumes that the trees are removed and not submerged—if submerged, significant amounts of methane would be emitted, increasing the greenhouse gas emissions since methane is 25 times more effective as a greenhouse gas than CO_2. Some of these emissions could be avoided if the wood is used as a product or as an energy source (replacing the use of non-renewable energy sources).

18C.5.15. COASTAL ZONE CONSISTENCY

The Ambrey Pond Reservoir Alternative would occur outside the coastal zone of the Town of Stony Point, and likely outside the area of effect of the town's LWRP, and likely beyond the area of concern of LWRPs of surrounding towns or the New York Department of State's coastal zone and policies. In addition, there are no LWRPs of surrounding or nearby communities that would affect or likely be affected by this alternative.

In comparison to the Proposed Project, which includes an intake pump station on the shoreline of the Hudson River and an intake structure within the river, this alternative would not require the construction of any facilities within the coastal zone. Therefore, a review of this alternative's consistency with coastal policies is not warranted.

18C.5.16. ENVIRONMENTAL JUSTICE

Based upon a screening of salient demographic characteristics of the population in the affected area, this analysis concludes that the Ambrey Pond Reservoir Alternative area does not have concentrations of minority or low-income populations that would be disproportionately affected by this alternative.[2] Therefore, Ambrey Pond Reservoir Alternative would not result in disproportionate impacts on minority or low-income populations.

---

[1] USDA, 2005, Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States.

[2] http://www.dec.ny.gov/docs/permits_ej_operations_pdf/rocklandco.pdf

Regarding the effects of potential rate increases related to the Ambrey Pond Reservoir Alternative, any potential rate increases would affect all portions of the Rockland County service area, including the potential environmental justice communities as well as non-environmental justice communities. Therefore, the potential environmental justice communities would not be disproportionately affected by such rate increases. It also should be noted that United Water provides relief to people facing temporary financial crises through its United Water Cares program. This program provides grants to pay the water bills of households in need through a network of community-based social service agencies located throughout United Water's service area. Any future rate increases related to the Ambrey Pond Reservoir Alternative would be subject to review by the PSC in accordance with its regulations and procedures. That review would take into account the effect of any rate increases on low-income customers as well as other concerns expressed by the public during the public review period.

18C.5.17. CUMULATIVE IMPACTS

Cumulative effects or impacts would occur from the incremental impact of implementing this alternative when added to other past, present, and reasonably foreseeable future actions. The cumulative effects may not be detectable in the individual context of direct and even indirect impacts, but nevertheless when added to other actions can eventually lead to measurable environmental change.

The future conditions expected to occur without this alternative include the known development projects cited in section 19.2.1 of Chapter 19, "Cumulative and Indirect Effects," and other future conditions currently anticipated. By including those projects in the future background condition, the analysis of this alternative's impacts considers the cumulative effects of those other projects with those of the Ambrey Pond Reservoir Alternative. As discussed in that section, the future background conditions assumed for the analyses presented in this DEIS—including the analysis of the Ambrey Pond Reservoir Alternative—are described in section 2.11 of Chapter 2, "Project Description," in the discussion of analysis framework.

These projects are part of the growth forecast for Rockland County in the future for the near- and long-term, as discussed in Chapter 6, "Socioeconomics," and Chapter 1, "Purpose and Need." United Water is planning necessary improvements to meet the water demands of the anticipated future growth. In that respect, the cumulative effects of these projects have been accounted for and are part of the purpose and need for the supplementing Rockland County's water supply system.

It is not anticipated that the Ambrey Pond Reservoir Alternative would result in any cumulative impacts because of the low level of development activity anticipated to occur in the immediate area. In addition, the park and open space uses of the public lands to the west of the reservoir site ensure the stability of the current land uses on these adjacent properties. Because this alternative is designed to supplement existing Rockland County water supply system with a long-term water supply to meet projected demands as the population increases, this alternative would have the same cumulative effects as the Proposed Project.

18C.6. EFFECTS OF THE AMBREY POND RESERVOIR ALTERNATIVE IN COMPARISON TO THOSE OF THE PROPOSED PROJECT

The alternatives analysis under SEQRA is ultimately a comparative one. It also seeks to identify and assess reasonable alternatives to the Proposed Project that mitigate the potential

environmental impacts of the Proposed Project to the maximum extent practicable given the other goals and objectives for the Proposed Project, and the capabilities of the Project sponsor. This section of the DEIS summarizes the effects of the Ambrey Pond Reservoir Alternative as compared to those of the Proposed Project.

Like the Proposed Project, the Ambrey Pond Reservoir Alternative would create a new long-term water supply source capable of providing 7.5 mgd of potable water as a supplement to United Water's existing water supply sources. This alternative relies on a surface water reservoir to collect and store water that would be filtered prior to delivery to Rockland County consumers. The water source of the reservoir would consist of portions of the Cedar Pond Brook watershed, comprising 12.2 square miles. The maximum safe yield of this catchment area is an estimated 7.9 mgd. The replenishment of the Ambrey Pond Reservoir would depend on the continuation of average rainfall amounts, and the ability of the reservoir to maintain a sustained yield during drought conditions may not be possible. In contrast, the Proposed Project would rely on the Hudson River for its source waters. The Hudson River watershed upstream of the Proposed Project comprises approximately 13,400 square miles, and the safe yield from a water supply perspective is on the order of 1,000 times greater than that of this alternative. Therefore, in comparison to the Proposed Project, this alternative provides a less sustainable and less drought-resistant water supply source due to limited ultimate safe yield of its watershed area.

Unlike this alternative, the Proposed Project requires the placement of a small building on the shoreline of the Hudson River; however, neither the Proposed Project nor this alternative would result in any significant adverse visual impacts. In addition, this alternative does not include construction or raw water intake operations within the significant habitat areas of the Hudson River and therefore avoids the Proposed Project's potential impacts on fisheries, benthic organisms, and significant habitat areas adjacent to the intake structure. However, compared to the Proposed Project, this alternative has a much more extensive and broad range of construction impacts requiring the clearing of approximately 200 acres of vegetation, including the excavation and inundation of nearly 38 acres of productive wetlands and 160 acres of forestland to build the dam structures, as well as other components comprising this alternative, including the new water treatment plant, roadway relocations, residential displacement, and the natural and cultural resource impacts of clearing nearly 200 acres (including land on which homes are occupied) in anticipation of future inundation.

Under this alternative, the ecological communities in the Ambrey Pond Reservoir area would be completely and permanently inundated by the reservoir construction. The reservoir is expected to result in impacts on numerous species, including species of concern. On balance, however, this alternative's open water reservoir is expected to provide productive fisheries habitat for many species already present in the existing ponds that would be inundated by the reservoir. In addition, the threatened bald eagle may benefit from the expansive open water and shorelines created by the reservoir.

Operations of the reservoir could, however, have additional adverse impacts on terrestrial and aquatic life, including fisheries. In particular, the aquatic life in the reservoir and in Cedar Pond and Tiorati Brooks could be adversely affected during dry years when water draw-down would be the greatest. It is anticipated, however, that NYSDEC permit conditions would require that minimum stream flow volumes below the impoundments be maintained for the purpose of reducing the potential for downstream impacts. In contrast, the Proposed Project would not result in adverse effects to flora and fauna on the Project Sites. Any adverse impacts on aquatic resources in the Hudson River related to entrainment and impingement of fish at the intake

structure would be minimized by the application of best technologies available, such as the use of a wedge-wire screen intake and low approach velocity intake rates.

Neither the Proposed Project nor this alternative are expected to result in adverse impacts on existing or future land uses, nor would either result in substantial additional demands for community services, such as police, fire, or emergency services. In comparison, the Proposed Project and this alternative would result in similar temporary construction-related traffic impacts, and neither would result in long-term, operation period traffic effects.

The alternative and the Proposed Project each would be expected to require the alienation of public parkland. However, the anticipated alienation resulting from the Proposed Project would stem from the potential tunneling under parkland for the placement of underground infrastructure (e.g., raw water transmission main routes), whereas the Ambrey Pond Reservoir Alternative would utilize the actual surface of Palisades Interstate Parkway lands for the Tiorati Brook impoundment, as well as for the raw water transmission main conveying impounded water to the main reservoir. While not alienation per se, this alternative would also result in the closure of the Stony Point municipal swimming pool complex that currently operates on land owned by United Water.

Estimated greenhouse gas emissions of this alternative would be lower than those of the Proposed Project on the basis of lower energy consumption during the treatment plant operations, however, in comparison to the Proposed Project, this alternative would result in the loss of substantially greater amounts of forested areas that currently sequester carbon. In addition, while the comparative greenhouse gas emissions associated with pipeline construction would be comparable, and the emissions associated with treatment plant construction would be less than those of the Proposed Project, this alternative would result in substantially greater emissions resulting from dam construction in comparison to the minimal earthwork and concrete structural work required for the Proposed Project.

In addition, the Ambrey Pond Reservoir Alternative would require the acquisition of an additional approximately 140 acres of land, and the potential displacement of approximately 13 residential structures from which residents would be displaced. The acquisitions would also potentially infringe on land used by scouting organizations for camp and recreational purposes, including portions of land associated with the Rockland County Girl Scout Council's Camp Addison Boyce. The alternative would also result in the displacement of the Town of Stony Point's municipal swimming pool, which is located on United Water land within the reservoir buffer area.

As discussed above in section 18C.4.2.1, the Ambrey Pond Reservoir Alternative is expected to cost from $86.4 million to $121.9 million more than the Proposed Project. In comparison to the Proposed Project, the Ambrey Pond Reservoir Alternative would be more expensive to construct, and would have a greater impact on ratepayers and consumers in the United Water service area. However, the Proposed Project would have higher annual operating costs resulting in higher potable water production costs.

As with the Proposed Project, this alternative would generate property tax revenues for the affected local and county governments, and the school districts, and both would place currently non-taxable lands on the tax rolls. United Water currently owns a substantial portion of the lands necessary to construct the Ambrey Pond Reservoir Alternative. These lands currently generate approximately $1.16 million of property taxes per year. The acquisition of additional lands, including currently tax-exempt lands, and the construction of improvements, such as the dams and water treatment facilities, would increase the amount of taxes generated by this alternative. Similarly, the Proposed Project would result in an estimated Phase 1 tax generation of

approximately $2.65 million per year, increasing to $5.58 million per year. With a higher cost than that of the Proposed Project, but taking into account the fact that these lands already generate property taxes while the land to be used for the Proposed Project does not, future property tax generation would be of a similar magnitude for the Proposed Project and the Ambrey Pond Reservoir Alternative. Both this alternative and the Proposed Project would employ fewer than 10 people for operational purposes.

In comparison to the Proposed Project, the Ambrey Pond Reservoir Alternative would result in more substantial adverse impacts on a greater range or environmental resources, and would therefore provide fewer public benefits than the Proposed Project in respect to mitigating environmental impacts.

Table 18C-16, below, summarizes the effects of this alternative in comparison to those of the Proposed Project.

Table 18C-16
Effects of the Ambrey Pond Reservoir Alternative in Comparison to the Proposed Project

Impact Area	Ambrey Pond Reservoir Alternative	Proposed Project: Haverstraw Water Supply Project
Safe Yield (Supply Source)	Phase 1: 3.1 mgd (Timp Mountain Brook) Phase 2 and 3: 7.9 mgd (addition of Tiorati Brook diversion)	Hudson River
Source Water Catchment Area	Phase 2: 3.4 square miles Phase 2:12.2 square miles	Phases 1, 2, and 3: 13,400 square miles
Potable Water Production Capacity	Phase 1: 2.5 mgd Phase 2: 5 mgd Phase 3: 7.5 mgd	Phase 1: 2.5 mgd Phase 2: 5 mgd Phase 3: 7.5 mgd
Capital Cost	Phase 1: $225.7 to $238.2 million Phase 2: $17.1 to $18.5 million Phase 3: $18.3 to $19.0 million Total: $261.1 to $275.7 million	Phase 1: $97.2 to $144.8 million Phase 2: $16.7 to $16.9 million Phase 3: $25.2 to $27.8 million Total: $139.2 to $189.3 million
Estimated Annual Operating Cost	Phase 1: $1.7 million Phase 2: $2.8 million Phase 3: $3.9 million	Phase 1: $2.2 million Phase 2: $4.0 million Phase 3: $5.6 million
Average Daily Cost Increase per Account (Ratepayer)	Phase 1: $1.55 to $1.62 Phase 2: $1.73 to $1.81 Phase 3: $1.99 to $2.07	Phase 1: $0.72 to $0.99 Phase 2: $0.91 to $1.17 Phase 3: $1.16 to $1.43
Average Daily Cost Increase per Single Family Household	Phase 1: $1.10 to $1.15 Phase 2: $1.23 to $1.29 Phase 3: $1.45 to $1.51	Phase 1: $0.51 to $0.70 Phase 2: $0.65 to $0.84 Phase 3: $0.85 to $1.05
Estimated Property Tax Payments	Phase 1: $6.58 million Phase 2: $8.2 million Phase 3: $12.65 million	Phase 1: $2.95 million Phase 2: $3.99 million Phase 3: $6.34 million

Table 18C-16 (cont'd)
Effects of the Ambrey Pond Reservoir Alternative in Comparison to the Proposed Project

Impact Area	Ambrey Pond Reservoir Alternative	Proposed Project: Haverstraw Water Supply Project
Land Use	Project area consists of open, forested and wetland areas; area characterized by low-density residential and park uses. 200 acres would be flooded, and approximately 13 residential land uses would be inundated or otherwise displaced. Segments of existing roadways to be relocated due to inundation. Displacement of Scout properties and Town of Stony Point swimming pool complex. Alienation of parkland due to construction of Tiorati Brook impoundment within Palisades Parkway median, and use of Harriman State Park lands for roadway relocations and raw water mains.	Construction of treatment plant adjacent to Haverstraw Landfill, wastewater treatment plant, industrial uses, and freight railroad right-of-way. Construction of intake pumping station on former industrial Hudson River waterfront site (Intake Site) adjacent to U.S. Gypsum Company plant and conveyor, and adjacent to residential and commercial marina uses. Potential alienation of parkland due to possible underground placement of raw water transmission main routes under Town of Haverstraw parkland areas (marina and boat yard).
Visual	Views would change from undeveloped vegetated land or residential property to open reservoir water surface.	Some visibility of newly constructed buildings. Intake pumping station would be visible from Hudson River vantages.
Community Facilities	Potential changes in emergency services response times due to relocated roads. Displacement of Town of Stony Point municipal swimming pool complex.	No new demand for community services.
Socioeconomics	Displacement of residential and recreational uses. Creation of fewer than 10 full-time jobs.	No direct displacement. Creation of fewer than 10 full-time jobs
Cultural Resources	Potential inundation of archaeological sites including 18 prehistoric sites and two historic-period sites.	Potential to affect archaeological resources on small segments of raw water transmission main and potable water main, depending what route is selected.
Geology, Soils, and Groundwater	Re-grading for dam and access road construction. Potential changes to the accumulation of sediments at the reservoir floor.	No impacts, since Project Sites have been affected and disturbed by past uses.
Natural Resources	Inundation of 200 acres, including 150 acres of forestland, and 38 acres of wetlands, riparian habitat, and open pond areas by reservoir construction. Disturbance of existing fish and wildlife habitat within the area of the reservoir, along the pipeline from the Tiorati Brook, impoundment and along the Brook as a result of water withdrawals. No significant adverse impacts on threatened or endangered species, although timber rattlesnake habitat disturbance likely. Creation of 200-acre water body that would provide fisheries habitat for some existing pond fish species	No significant adverse impacts on terrestrial plant communities or wildlife, or on threatened or endangered species, floodplains, wetlands, water quality, or aquatic biota in the Hudson River and Minisceongo Creek. Minimal potential impacts on aquatic resources of the Hudson River during construction due to cofferdam. Removal of habitat areas associated with landfill stormwater drainage features on Water Treatment Plant Site, if not removed sooner by the Town of Haverstraw, which would not result in significant adverse impacts on terrestrial plant communities or wildlife resources.

Table 18C-16 (cont'd)
Effects of the Ambrey Pond Reservoir Alternative in Comparison to the Proposed Project

Impact Area	Ambrey Pond Reservoir Alternative	Proposed Project: Haverstraw Water Supply Project
Natural Resources (cont'd)	Creation of 200 acre water body that would provide fisheries habitat for some existing pond fish species Open water area and shoreline would benefit nearby bald eagle populations. Operations would not result in significant adverse impacts on birds and other wildlife using the existing habitats adjacent to the project sites.	Discharge of diluted reverse osmosis concentrate to the Hudson River would not result in adverse impacts on water quality or aquatic biota. Potential impacts on fisheries and macroinvertebrates resulting from withdrawal of 10 mgd of Hudson River water have been minimized through use of best technology available, such as wedge-wire screen intake structure and low approach velocity intake design. Operations would not result in significant adverse impacts on birds and other wildlife using the existing habitats adjacent to the Project Sites.
Hazardous Materials	Use and storage of petroleum and chemicals necessary for treatment processes at reservoir water treatment plant.	Potential disturbance to known subsurface hazardous materials. Use and storage of petroleum and chemicals necessary for treatment processes at Water Treatment Plant Site.
Infrastructure	Increased demand for electricity to operate dams, pumps and treatment facilities	Increased demand for electricity to operate pumps and treatment facilities
Traffic	Minimal increases in traffic from reservoir and treatment plant operations. Sections of Bulsontown Road, Cedar Flats Road, and Mott Farm Road to be displaced and realigned due to inundation by reservoir.	Minimal increases in traffic from Intake Site and Water Treatment Plant Site from operation of the Proposed Project. Short-term traffic impacts during construction of raw water transmission main (open cut).
Noise	Noise impacts during construction. Minimal impacts from ventilation systems and new truck traffic.	Noise impacts during construction. Minimal impacts from ventilation systems and new truck traffic.
Air Quality	Minor increases in air emissions would occur during construction on roadways near the project sites due to increase in worker vehicles and truck trips. Operation of reservoir would reduce emissions due to elimination of current residential and recreational traffic generated by reservoir site parcels.	Minor increases in air emissions would occur during construction on roadways near the project sites due to increase in worker vehicles and truck trips.
Global Climate Change	Annualized emissions are estimated at approximately 2,694 to 3,066 metric tons CO_{2e} per year.	Annualized emissions are estimated at approximately 6,821 metric tons CO_{2e} per year.

Note: Costs are in 2010 dollars.

✷