## Cannondale Well, Wilton

Diversion Permit Application Informational Meeting November 7, 2018





- Introduction
- Background
- Pump Test Program
- Private Well Evaluation
- Ecological Evaluation
- Mitigation Plan
- Next Steps

Our goal is to improve system resiliency by utilizing an existing well while minimizing impacts to the environment.

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2

## **Introduction - History**

- 1971-1982: Field Investigations
- 1982: Well Construction
- 1983: Well Registration
- 1984: 90-day Pump Test
  - 1.5 mgd pumping rate
  - 21 Observation Wells
  - 4 Norwalk River Gages
- Well not placed in service





## Introduction – Project Benefits

- Improved Resiliency
  - System Failure
  - Drought
- Conjunctive Use with Reservoirs
- Augment the Greater Bridgeport System
  - 1 mgd maximum
  - Mitigation Plan





#### Introduction – Water Used Locally

#### Norwalk River Sub-Basin

2008 - 2018 Monthly Averages







## Background

- October 13, 2011 Pre-Application Meeting with CT DEEP
- Findings: 1984 90-day aquifer test sufficient for permit process
- Considerations
  - Aquatic life in the Norwalk River
  - CTDOT Mitigation Wetland (function & underlying material)
  - White River Crayfish at Goetzen Brook
  - YMCA Pond
  - Private Wells
  - Reported releases in the area
- Actions Needed
  - New 72-hour aquifer test
  - Baseline testing / water quality testing
  - Update Norwalk River 7Q/10





## Background

- November 3, 2011 Meeting with CT DEEP Fisheries
  - Findings: Proposed withdrawal feasible with mitigation
  - Norwalk River Fisheries
    - Class 3 Wild Trout Management Area
    - Existing populations of wild trout enhanced through stocking
    - Brown trout fry stocked at Cannondale Dam & Wolfpit Rd.
    - Maintain stream base flow
  - Actions Needed
    - Categorize watercourse within well Area of Influence
    - Prepare cross sections
    - Conduct wetted perimeter analysis



## Background

- 2013: Develop Groundwater Flow Model
  - Determine Area of Influence (1960's drought conditions)
- March 2017: Meet with CTDEEP
  - Review 2013 Aquifer Test Results
  - Need for Mitigation Plan
    - Conduct Ecological Baseline Survey
- March 2018: Update Low-Flow Statistics



#### **Private Well Study**



#### **Private Well Study**

- Production well completed in overburden no impact to bedrock
- 1984 90 Day Test documented impact to 2 overburden wells
  - Hansen Well Hand Dug Well (22' deep)
  - 415 Danbury Road (11' deep well replaced with 152' deep well)



## **Pump Testing**

# July 2013: conducted a 6-day constant rate aquifer test

- 1.3 mgd pumping rate
- 3 monitoring wells
- 8 piezometers
  - Norwalk River
  - Goetzen Brook
  - CTDOT Mitigation Wetland
- 3 surface water stream gage locations
  - Norwalk River
    - SG-1
    - USGS Gage #01209700
  - Goetzen Brook (SG-2)



## **Ecological Evaluation**

#### Observed Impacts During Tests

- Goetzen Brook
  - 2013 Test: No discernable impact
  - No anticipated impact to brook, wetland habitat, or White River Crayfish
- YMCA Pond
  - 1984 Test: Pond not monitored
    - No reported impact to pond
  - Small impact on groundwater in nearby well (WN-66 located 450 ft away from pond)
    - 0.9 ft. after 3 days
    - 3.6 ft. after 90 days



#### **Ecological Evaluation**

- Identified Sensitive Receptors
  - Norwalk River
    - 1984 Test Results @ 1.5 mgd
      - ≤ 30% reported from induced infiltration
        - 30% of 1 MGD = 0.46 cfs (206 gpm) Norwalk River Average Annual Discharge (SG-1) = 49.7 cfs
  - Floodplain & DOT Mitigation Wetlands
    - 1984 Test Impact to floodplain wetland south of PW-1 (WN-80 & WN-94)
      - 1.6' 1.7' drawdown after 3 days
      - $\qquad 8.9'-12.4' \ drawdown \ after \ 90 \ days$
    - 2013 Test Impact to DOT Mitigation Wetlands (PZ-5 & PZ-6)
      - 1.5' 2' drawdown after 6 days
      - Surface water went dry at PZ-6



## **Ecological Evaluation**

- Mitigation Plan Objectives
  - Norwalk River
    - Mitigate stream flow impacts during low flow periods
  - Wetlands
    - Maintain seasonally saturated soil conditions to preserve wetland habitat
  - Vernal Pools
    - Support breeding of amphibians in spring



## **Ecological Baseline Survey**

- May October 2017
  - Characterize sensitive receptors
  - Identify species and critical periods in species' life cycle
- Sensitive Receptors
  - Forested Floodplain & CTDOT Mitigation Wetland
  - Vernal Pools
    - 3 pools identified: two are seasonally flooded woodland pools, one constructed
- Norwalk River
  - Assess river characteristics in consultation with DEEP Fisheries

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- 5 pools between dam above Cannon Rd. and Wilton YMCA
- Review of available fisheries data
- Evaluation of two river cross-sections
- Wetted perimeter analysis



#### Wetted Perimeter Analysis

• Surveyed Cross Sections - June 28, 2017





#### Wetted Perimeter Analysis

Cross Section #1 Estimated at Low Flow With & Without Pumping
73% of 7Q10 – Stage/Wetted Perimeter Reduction of 0.02'/0.13'



#### Wetted Perimeter Analysis

Cross Section #2 Estimated at Low Flow With & Without Pumping
73% of 7Q10 – Stage/Wetted Perimeter Reduction of 0.03'/0.64'



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18

## **Ecological Baseline Survey**

- Results Critical Habitats
  - Vernal Pools
    - Support breeding of amphibians in the spring
    - Wood frog egg mass and fairy shrimp identified
      - Maintain sufficient pool during breeding cycle (March thru June)
  - Forested Floodplain & CTDOT Mitigation Wetland
    - Wetland Plants hydrophytic vegetation, trees & shrubs
    - Requires seasonally saturated soil conditions
      - Maintain wet (reducing environment) during early spring growing season
  - Norwalk River
    - Class 3 Wild Trout Management Area
    - Maintain habitat for trout throughout the drier summer months
      - Maintain stream base flow during low flow periods



- Goal: Maintain vernal pool water levels to promote obligate species to complete the annual breeding cycle
- Plan
  - No pumping during spring breeding season (March thru June)
  - Conduct monthly monitoring of surface water & groundwater levels
    - Permanent pressure transducers collecting daily measurements
    - First year operation monitor monthly, then quarterly
  - Conduct annual spring vernal pool breeding surveys
    - Evaluate breeding success
  - Review January February surface water & groundwater levels

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• Evaluate if further pumping restrictions are needed

- Goal: Maintain floodplain and DOT wetland groundwater levels to support existing plant community
- Plan
  - Permanent vegetation transect
    - 1 per system with 3 or more vegetation plots per transect
  - Conduct annual vegetation survey
    - Evaluate plant health and changes in community
    - Evaluate short- and long-term pumping related impacts
  - Conduct monthly monitoring of piezometer in DOT mitigation wetland
    - Evaluate seasonal and pumping-related changes in groundwater levels

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21

- Goal: Maintain Norwalk River flow to provide habitat for trout
- Plan
  - Maintain fisheries habitat during low flow period (typically July through September)
  - Permanent stream gage upstream of well (USGS)
  - Calculate daily 7-day average flow during low flow period
  - Streambed permeability testing near the well to confirm river infiltration
  - Limit pumping to 10% of the calculated 7-day average flow

- Goal: Identify and implement mitigation measures if needed for two potentially impacted private wells
- Plan
  - Confirm current condition of overburden potable supply wells
    - Determine if deepened or abandoned
    - Determine if any additional overburden wells are within 1,500'
  - Monitor overburden wells within 1,500' during long-term pumping
    - Permanent pressure transducer collecting daily measurements
    - Weekly review during summer months or periods of extended pumping

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- Evaluate potential interference from PW-1
  - Evaluate frequency and magnitude of interference
  - Evaluate season variations of interference



23

- Max withdrawal = 1 mgd (1.5 cfs)
- No pumping March June
- Pumping Impact <10% of river flow
  - @ 30% depletion ratio max flow reduction = 0.46 cfs
    - Maximum allowed withdrawal
    - 30% depletion ratio
    - Daily flow changes
    - Norwalk River @ S. Wilton





Estimated Average Monthly Withdrawal 2009 - 2017



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• Norwalk River Flow Impacts @ Cannondale

Recurrence <sup>1</sup>	Without Withdrawal <sup>2</sup> (cfs)	With Max. Withdrawal <sup>3</sup> (cfs)
Q99	1.10	1.06
Q90	3.46	3.23
Q50	18.26	18.15
Q10	66.24	65.22
Q1	216.59	216.57

- 1. October 2008 September 2018
- 2. Based on Norwalk River @ South Wilton USGS gage
- 3. Estimated



#### **NEXT STEPS**

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