A. This Agreement shall be effective as of July 25, 2011 (the Effective Date) and shall continue in force and effect until July 25, 2013, unless terminated earlier as provided herein.

B. City shall have the right to terminate this Agreement for "cause" at any time, but only upon twelve (12) months written notice. "Cause" shall mean:

(1) Continuing exceedances of the Flow and Loadings Limits which are not corrected as required by this Agreement and which impair the safe and efficient operation of the City's wastewater facilities or which cause City to be in violation of permits issued by PADEP or EPA; or

(2) Failure by DELCORA to meet its financial obligations under this Agreement for a period of three (3) consecutive months; or

(3) Failure by DELCORA to meet its obligations for PCB Minimization as set forth in Section III.H of this Agreement; or

(4) Failure by DELCORA to comply with a final decision or determination of an Arbitration Panel or court of competent jurisdiction rendered under this Agreement within three (3) months of the date the decision or determination became final, unless otherwise specified by the Arbitration Panel or court of competent jurisdiction.

C. AUTOMATIC EXTENSION OF CONTRACT TERM

It is anticipated that the City will provide DELCORA with its proportionate share of the City's Long Term Control Plan costs by no later than July 25, 2012 thus giving DELCORA one full year to review the costs and analyze its options. In the event that the City does not provide DELCORA this information by July 25, 2012 the term of this Agreement shall be automatically extended so that DELCORA shall have one full year to review the costs and analyze its options. For example, should the City not provide DELCORA with its proportionate share of the City's Long Term Control Plan costs until October 25, 2012, then the term of this Agreement shall be automatically extended to October 25, 2013 thus allowing DELCORA one full year to review the costs and analyze its options.

III. SCOPE OF SERVICES/WASTEWATER LIMITS

A. Wastewater Treatment Services. City shall convey, treat and dispose of wastewater and its byproducts delivered by DELCORA to the approved connection point at the SWWPCP.

B. Flow and Loadings Limits. The wastewater delivered by DELCORA to City shall not exceed the limitations set forth in the "Flow and Loadings Limits Addendum" (attached hereto and incorporated as Exhibit "A"). Parties acknowledge that the flows and loadings permitted by this Agreement are in no way guaranteed to be continued beyond the term of this Agreement.

C. Prohibition on Wastewater From Marcellus Shale Operations. DELCORA shall not be permitted to deliver wastewater to the City which originates in operations related to the extraction of natural gas from the Marcellus Shale region without the written approval of the City.

D. Prohibition on Discharges that Exceed the Flow Limits and Loadings Limits. DELCORA's wastewater flow shall not exceed the Flow Limits set forth in the Flow and Loadings Limits Addendum. DELCORA's discharges may not exceed the Annual Loadings Limits, either for BOD or SS. No planned activity that will cause an exceedance shall be permitted without the written approval of City. DELCORA shall be responsible for all City costs and damages caused by its exceedances of the stated Flow and Loadings Limits.

E. Exceedance Charges. DELCORA shall be liable to pay City for exceedances of the Flow and Loadings Limits as set forth in the Flow and Loadings Limits Addendum in accordance with the "Exceedance Charge Addendum" (attached hereto and incorporated herein as Exhibit "B").

F. Plan to Eliminate Exceedances. If DELCORA's discharge to City is a Prohibited Exceedance as defined in Section III.D of this Agreement, then DELCORA shall do the following:

(1) Flow Exceedances. Within ninety (90) days of written notice from City, DELCORA shall develop and submit a written report detailing a plan of action to eliminate the Prohibited Exceedances within a one (1) year period from the date of the notice. Within thirty (30) days of receipt of the plan, DELCORA and City shall meet to discuss the content of DELCORA's proposed plan, including any revisions to be required by City prior to implementation of the plan. Unless the City submits written amendments to the plan to DELCORA within thirty (30) days of

the date of the meeting, the plan shall be deemed to be approved. If DELCORA fails to submit a report outlining a plan to eliminate exceedances or if City is prohibited from approving the plan due to technical or legal reasons, DELCORA shall pay City the sum of One Thousand Dollars ($1,000.00) per week or part thereof, until such time as DELCORA submits an approvable plan. In the event of a Flow Exceedance, nothing herein shall require City to certify the availability of treatment capacity until any Flow Exceedances have been eliminated or abated. During the pendency of any approved remediation plan, as provided under this paragraph, DELCORA shall not be liable to City for any fines or penalties for flow exceedances as provided under this Agreement. This exception shall not apply to exceedance charges incurred by DELCORA.

(2) Loadings Limits Exceedances. Within ninety (90) days of written notice from City, DELCORA shall develop and submit to City a written report detailing the circumstances that caused the Loading Limits exceedance and a plan of action to immediately eliminate the Prohibited Exceedances. Within thirty (30) days of receipt of the plan, DELCORA and City shall meet to discuss the content of DELCORA's proposed plan, including any revisions to be required by City prior to implementation of the plan. Unless the City submits written amendments to the plan to DELCORA within thirty (30) days of the date of the meeting, the plan shall be deemed to be approved. If DELCORA fails to submit a report outlining a plan to eliminate any Loading Limit exceedance or if City is prohibited from approving the plan due to technical or legal reasons, DELCORA shall pay City the sum of One Thousand Dollars ($1,000.00) per week or part thereof, until such time as DELCORA submits an approvable plan. During the pendency of any approved remediation plan, as provided under this paragraph, DELCORA shall not be liable to City for any fines or penalties for Loading Limits exceedances as provided under this Agreement. This exception shall not apply to exceedance charges incurred by DELCORA.

G. Certification of Sewer Capacity. City may determine that City does not have adequate sewer capacity to permit additional sewer connections to any part of DELCORA's system that will discharge to City if DELCORA has exceeded the Flow and/or Loading Limits set forth in Exhibit "A" and has failed to submit an appropriate remediation plan approved by the City, as provided under Section III. F of this Agreement.

H. Polychlorinated Biphenyls Minimization. DRBC's Water Quality Regulation and Water Code Section 4.30.9 requires City to implement a Pollutant Minimization Plan ("PMP") at its SWWPCP to

reduce its contribution of PCBs to the Delaware Estuary. In order to ensure City's compliance with this requirement DELCORA shall:

(1) Within ninety (90) days of the Effective Date of this Agreement, supply City with any information it has regarding PCBs within the DELCORA drainage area whose wastewater is delivered to the City.

(2) Provide an annual update regarding PCBs within the DELCORA service area for City's annual PMP report. The update shall be submitted at least thirty (30) days prior to the due date of City's report to DRBC.

(3) Implement any and all new and/or more stringent PCB requirements or reductions that may be imposed upon the City's SWWPCP. DELCORA agrees to implement these requirements or reductions in its drainage area simultaneously with City's implementation of these new requirements.

(4) Accept a numeric limit for PCB discharge into the SWWPCP which shall be consistent with DELCORA's proportionate flows into the SWWPCP in both dry and wet weather situations if at any time a numeric limit for PCBs is imposed upon discharges from City's SWWPCP.

(5) Upon request by City, implement a PMP throughout the entire drainage area of DELCORA that contributes flow to the SWWPCP in order to achieve the maximum practicable reduction, as defined in DRBC's regulations, of PCBs into the SWWPCP.

(6) Cooperate with any City investigation or trackdown of PCBs within DELCORA's drainage area that contributes flow to the SWWPCP.

IV. BILLING, PAYMENTS AND CHANGE IN RATES

A. DELCORA shall pay wastewater treatment charges consisting of its proportionate allocation of the capital, operation and maintenance costs of City's wastewater conveyance and treatment facilities in accordance with generally accepted wastewater rate methodologies, as determined by the City's most recent rate study completed by City's consultant. DELCORA shall also pay a management fee to City.

(1) Wastewater Treatment Charges:

(a) Capital Charges. The capital charges shall include depreciation expense and a Rate of Return on Investment ("ROI") on facilities allocated to DELCORA. Depreciation and ROI capital charges shall apply to all applicable capital projects which are completed and placed into service on or after July 1, 2011. Depreciation and ROI shall be billed as a fixed monthly charge. Depreciation and ROI shall not be billed on assets which were constructed and placed into service prior to July 1, 2011.

(b) Operations and Maintenance Charges. Operation and maintenance charges shall include, but not be limited to, expenses associated with the operation, maintenance, repairs, rentals and replacements of City's wastewater facilities appropriately allocated to DELCORA, as well as appropriate shares of employee benefits, departmental overhead and other allocable non-direct overhead expenses. Operation and maintenance costs so allocated shall be net of miscellaneous operating revenues related to those expenses.

(c) Management Fee. The management fee shall equal twelve percent (12%) of the total Wastewater Treatment Charges.

(2) DELCORA's Wastewater Treatment Charges, beginning on January 1, 2011 and for Fiscal Year 2012, shall be as shown in Exhibit "D", TABLE A-49 of this Agreement and shall remain in effect until revised in accordance with the terms of this Agreement.

(3) DELCORA shall have the right, upon written request, to review City's method of computing the charges for, and allocating the cost of providing wastewater treatment services to DELCORA. Such review shall be subject to the provisions relating to Notice of Changes in Rates (Section IV.C).

(4) Capital charges shall be billed to DELCORA as follows:

(a) For wastewater services rendered through June 30, 2011 DELCORA shall be liable for City capital charges as required under the terms of the 1974 Agreement, as amended.

(b) City shall reconcile Capital charges to DELCORA as of June 30, 2011 using its standard procedure for reconciling capital charges under the 1974 Agreement, as amended. Any overpayment by DELCORA to City shall be credited to DELCORA within thirty days from the City's signing of this Agreement..

(c) For wastewater services rendered on July 1, 2011 and thereafter DELCORA shall be liable for capital charges in the form of Depreciation and ROI.

(5) Should the City continue to provide wastewater treatment services to DELCORA after the expiration of the term of this Agreement, as set forth in Section II, DELCORA shall be responsible for paying its proportionate share of the City's cost of complying with the City's Long Term Control Plan. As of the Effective Date of this Agreement, this proportionate share has not yet been negotiated or agreed upon by the Parties.

The City and DELCORA hope to reach an agreement on DELCORA's proportionate share of the City's LTCP costs prior to the expiration of this Agreement. DELCORA is preparing an ACT 537 Plan to determine its options for wastewater treatment and to control Inflow and Infiltration in the Eastern Delaware County Service Area. It is anticipated that this plan may take up to two years to complete depending on the cooperation received from the participating Eastern Municipalities.

If, however, the City and DELCORA are unable to reach an agreement on DELCORA's proportionate share of the City's LTCP costs prior to the expiration of this Agreement then the following shall occur:

A. The City shall no longer provide wastewater treatment services for DELCORA.

B. DELCORA shall immediately initiate its plans for treatment of all its wastewater at facilities other than the SWWPCP and shall complete its plans and any new treatment facilities required as expeditiously as possible.

C. In the interim, while DELCORA is completing its plans and any new treatment facilities required to remove its wastewater from the SWWPPC, the City shall continue to provide treatment of DELCORA's wastewater under the terms and conditions of this Agreement..

D In addition to all other charges owed the City under the Agreement, DELCORA shall pay the City annually the amount of $2,000,000 (Two Million Dollars) as its partial proportionate share of the City's LTCP costs. These annual payments shall begin upon the expiration of the term of this Agreement as provided under Section II of the Agreement and shall continue for each and every year, or part thereof, the City continues to serve DELCORA. The $2,000,000 annual partial proportionate share payment shall be billed monthly as an additional charge of $166,666.67.

E. The City reserves the right to initiate arbitration under this Agreement to have DELCORA pay its full proportionate share of the City's LTCP costs during the period of time the City continues to treat DELCORA's wastewater.

B. Billing.

(1) City shall provide DELCORA with wastewater flow and loadings data and computations utilized in billing DELCORA for the three (3) month periods ending in March, June, September, and December. Billings for all other months will be estimates based upon one-third (1/3) of the amount of the prior quarter's billing.

(2) City shall render bills to DELCORA on a monthly basis for the charges set forth in this Agreement. Annual charges shall be divided by twelve (12) for purposes of rendering monthly billings.

(3) Bills shall be payable to City by DELCORA within thirty (30) days of receipt of the bill by DELCORA. If DELCORA objects to any bill, in whole or in part, DELCORA shall notify City in writing prior to the bill's due date. (This writing shall hereinafter be referred to as the "Objection Letter".)

(a) The Objection Letter shall state in detail the exact nature of the objections and shall include any and all facts and documentation supporting the objections. Within thirty (30) days after receipt of the Objection Letter, City and DELCORA shall meet to discuss the substance of the Objection Letter, and shall attempt to reach a resolution of the matters raised in DELCORA's Objection Letter. In the event that no such resolution can be reached, then the parties may proceed to Arbitration as provided under Section VIII of this Agreement.

(b) Within sixty (60) days after receipt by City of the Objection Letter, City and DELCORA may proceed to arbitration pursuant to Section VIII of this Agreement to resolve the specific objections made in the Objection Letter.

(c) During the sixty (60) day period prior to arbitration, DELCORA shall have the opportunity to conduct an inspection and audit of City records in accordance with Section X.A of this Agreement.

All billings, including those subject to an Objection Letter, shall be paid in full and by the due date. Late fees at the rate of one and one-quarter percent (1-1/4%) per month simple interest shall be added to any balance unpaid thirty (30) days after billing.

C. Notice of Changes in Rates.

(1) City shall provide notice to DELCORA of any change in rates or billing practices at least ninety (90) days in advance of the effective date of such new rates or practices. The City agrees that its rate methodology shall use and remain consistent with WEF Manual of Practice 27, Financing and Charges for Wastewater Systems, as amended or succeeded during the term of this Agreement.

(2) If DELCORA has an objection to the change in rates or billing practices it shall notify City in writing within ninety (90) days from receipt of the City's notice as to its specific objection(s) (This writing shall hereinafter be referred to as the "Change Objection Letter").

(a) The Change Objection Letter shall include any and all facts or documentation supporting the specific objections contained therein.

(b) The Change Objection Letter shall automatically be deemed to be a demand for arbitration and the Parties shall immediately proceed to arbitration in accordance with Section VIII of this Agreement.

(3) In the event DELCORA fails to serve City with a Change Objection Letter within ninety (90) days from receipt of City's notice, the rate increase or change in billing practices shall be deemed fully accepted and approved by DELCORA, and DELCORA shall have waived all rights under this Agreement or by any other legal proceeding to dispute the rate increase or change in billing practices.

(4) Parties agree to accept the rate development methodology used by the City in determining the rates and charges described in Section IV and Exhibit "D" of this Agreement. DELCORA shall have the right to dispute the calculation of wastewater treatment charges set pursuant to this Agreement, however DELCORA shall not have the right to dispute, by arbitration or any other legal proceeding, the methodology used by the City in developing said charges to DELCORA.

(5) Should there be any material change to the Rate Making Methodologies (in narrative form), as set forth in Attachment F to this Agreement, after the Effective Date of this Agreement, the City shall notify DELCORA of such change. A material change is defined as any change to the Rate Making Methodologies that would result in an overall annual increase to DELCORA of 1% (one percent) or more in its DELCORA Agreement. DELCORA shall have the right to review and challenge this material change should DELCORA deem it appropriate. While DELCORA agrees to accept the current Rate Making Methodologies, as set forth in Attachment D to this Agreement, it retains the right to review and challenge specific costs for materials, services and projects billed by the City to DELCORA.

(6) The Rate of Return charged shall also not be subject to dispute by DELCORA unless the City increases the Rate of Return to a rate higher than eight percent (8%) per annum. Exhibit "D" is attached to this Agreement as a description of the methodology currently utilized by the City in developing rates under this Agreement.

V. CONSTRUCTION, OPERATION, AND MAINTENANCE OF DELCORA's CONVEYANCE SYSTEM

A. Ownership and Maintenance of Force Main DELCORA at its sole cost and expense shall operate and maintain the force main necessary to convey its wastewater to the City system. DELCORA shall make all necessary repairs in a timely manner.

B. Approved Connection Points. DELCORA's wastewater shall be delivered to the City via a force main entering the City's SWWPCP.

C. Plan to Eliminate Unauthorized or Harmful Discharges.

(1) Within thirty (30) days of written notice from the City, DELCORA shall submit a plan to City outlining action(s) to be taken to eliminate unauthorized or harmful discharges if any discharges from DELCORA are determined by City or any governmental regulatory agency to be:

(a) maintenance problems, or

(b) sources of unauthorized discharge(s), or

(c) sources of discharge(s) which adversely affect the City's wastewater collection and treatment system, or

(d) sources of discharge(s) which cause or contribute to any violation of federal, state or local laws or permits.

(2) City shall promptly approve or reject said plan, and shall notify DELCORA, in writing, of the basis for the rejection of the proposed plan. In the event that City rejects DELCORA's proposed plan, the Parties agree to promptly meet and discuss the basis for City's rejection and to negotiate terms acceptable to City.

(3) Any action taken pursuant to this section shall be at the sole expense of DELCORA.

VI. METERING AND SAMPLING

A. Meters and Equipment. City shall own and maintain the meter(s), metering equipment, and the electronics associated with the meters at the SWWPCP. Upon request, City shall provide DELCORA with copies of all metering and calibration tests/studies performed on any City meters.

B. Metering.

(1) City shall measure wastewater flow and loadings by metering and sampling. DELCORA, upon reasonable notice to City, shall be entitled to jointly inspect the metering equipment maintained by City. City shall base its operation and maintenance charges on its actual flow and loadings measures whenever possible and reasonable. In the absence of actual flow and loadings measures, City shall estimate for billing purposes using its standard methods for estimating flow(s) and/or strength(s).

(2) DELCORA may install telemetry equipment to bring the sewage flow information into its SCADA system at DELCORA's expense.

C. Sampling.

(1) City shall have the right to enter the area serviced by DELCORA at any time for the following purposes:

(a) To sample the wastewater of a SIU,

(b) To inspect the facilities of a SIU,

(c) To trace a spill into the wastewater system which is believed to originate in an area served by DELCORA.

In the above instances, City will make a reasonable effort to notify DELCORA in advance.

(2) DELCORA shall have the right to obtain splits of wastewater samples taken by the City for billing purposes.

(3) The City shall base the TSS and BOD portion of the bill on the results of 24 hour sampling of the DELCORA flow. The TSS and BOD analyses shall be by PA DEP accredited methodologies in accordance with the City's PA DEP laboratory certification under Chapter 252 of the Pennsylvania code number 25.

(4) The City shall supply QA/QC laboratory data upon request.

VII. PRETREATMENT AGREEMENT

Interjurisdictional Pretreatment Agreement. City and DELCORA shall enter into the contract entitled "Interjurisdictional Pretreatment Agreement" (attached hereto and incorporated herein as Exhibit "C"). DELCORA agrees to comply with all of the provisions contained therein including but not limited to adoption of City's most recent Wastewater Control Regulations. DELCORA further agrees to require that any outside jurisdictions which contribute to DELCORA's sewer system also adopt and enforce City's Wastewater Control Regulations.

VIII. DISPUTES

A. Arbitration of Disputes. In the event of a dispute between the Parties concerning terms, conditions and covenants of this Agreement or upon the issuance by DELCORA of an Objection Letter or Change Objection Letter, City and DELCORA agree to submit the dispute to an Arbitration Panel. All petitions to compel or stay arbitration shall be filed in the Philadelphia County Court of Common Pleas and both City and DELCORA agree to accept venue therein.

B. The Arbitration Panel shall be composed of three (3) arbitrators, one appointed by City, one by DELCORA, and the third by agreement of the arbitrators selected by City and DELCORA.

(1) The arbitrators representing DELCORA and City shall be named within five (5) days from the request for the appointment of an Arbitration Panel. If after a period of ten (10) days from the date of the appointment, the two (2) arbitrators appointed by City and DELCORA cannot agree on the third arbitrator, then either appointed arbitrator may request the American Arbitration Association or its successor to furnish a list of three (3) members of said Association, who are not residents of either Philadelphia or Delaware counties, from which the third arbitrator shall be selected.

(2) The arbitrator appointed by DELCORA shall then eliminate one (1) name from the list furnished by the American Arbitration Association within five (5) days after its publication, following which the arbitrator appointed by City shall eliminate one (1) name from the list within five (5) days thereafter. The individual whose name remains on the list shall be the third arbitrator and shall act as Chairman of the Arbitration Panel.

(3) Each of the Parties shall bear the costs of its own arbitrator and shall equally divide the costs of the third arbitrator and all other common costs.

(4) The arbitration proceedings shall commence within thirty (30) days of the selection of the third arbitrator and the arbitrators shall render their determination within thirty (30) days after the final hearing held by the Arbitration Panel. Except in the case of fraud, the decision of the Arbitration Panel shall be final and binding upon the Parties, except in the case of fraud, except that in rendering their decision, the Arbitration Panel shall be bound by the terms and conditions of this Agreement, and may not make findings that in any way add to, subtract from, or modify the terms of this Agreement.

(5) Upon mutual agreement of the City and DELCORA, the arbitration may be delayed for a specified period of time in order to allow the Parties additional time to reach a negotiated settlement. Any delay in commencement of the arbitration shall last only as long as is agreed to by the Parties.

IX. INDEMNIFICATION

A. DELCORA agrees to defend, indemnify and save harmless City from and against any and all claims, actions, causes, suits, demands, losses, interest, penalties and liabilities arising from performance of the terms and conditions of this Agreement by reason of:

(1) City's inability, due to causes beyond its control, to perform any of the provisions of this Agreement;

(2) Injury (including death) to persons and damages to property resulting from operations under this Agreement to convey DELCORA's wastewater to the SWWPCP, where such injury is due to the negligence of DELCORA or its employees, servants or agents or the inherent nature of their operations;

(3) EPA or PADEP action of any kind whatsoever, whether direct or indirect, for any work undertaken by DELCORA, its contractors or consultants, necessary and required by this Agreement due to rejection of said work by the EPA or PADEP; and

(4) any grant fund, or any portion thereof, received by DELCORA and later determined to be ineligible for reimbursement by the appropriate regulator agency or grant auditors.

B. City and DELCORA agree that in the event of EPA or PADEP action or any other governmental regulatory action against City of any kind whatsoever, for activities carried out under this Agreement either by City or DELCORA or their employees, servants or agents, City and DELCORA shall equitably apportion responsibility for payment of any costs, fines, penalties or damages arising from such action. Should the City bill DELCORA pursuant to this paragraph, the City shall inform DELCORA as to the nature of the bill. If the parties are unable to reach an agreement on the apportionment of responsibility for any payment hereunder, either may proceed to arbitration under the terms of this Agreement.

C. DELCORA shall not be liable for injuries (including death) or property damage occurring during the course of treatment at the plant(s), except to the extent that such injuries and damages are due to the negligence of DELCORA or its employees, servants or agents and where such injuries result in a direct increase to City's operating costs. DELCORA shall be responsible for its proportionate share of those increased costs.

D. Nothing set forth in this Agreement shall limit or debar either party from resorting to any appropriate remedy in law or equity, or any combination of remedies for non-compliance with this section of the Agreement, however, jurisdiction over disputes regarding to this section shall first be subject to resolution as provided under Section VIII of this Agreement.

E. Nothing contained in this Agreement shall be deemed to confer upon any third person any right against City or DELCORA or to vest in said third person any cause of action against City or DELCORA or to authorize any such third person to institute any suit or suits against City or DELCORA.

X. MISCELLANEOUS

A. Inspection and Audit. City and DELCORA agree to maintain complete records and accounts concerning their responsibilities under this Agreement. Both Parties shall at all times have the right to examine and inspect said records and accounts upon thirty (30) days written notice. If required by any law or regulation, DELCORA shall make said records and accounts immediately available to federal and state authorities.

B. No Transfer of Rights. DELCORA shall not confer, transfer, convey, assign or license to any third party any rights obtained under this Agreement including but not limited to assignment of wastewater treatment capacity without the express prior written consent of City. Any other transfer by either of the Parties shall not impede the rights of either City or DELCORA.

C. Ownership, Management and Control of Plant Facilities. City retains sole ownership and control of the SWWPCP and all other wastewater conveyance and treatment facilities in the City and agrees to operate, maintain, repair, and improve its facilities associated with service to DELCORA. City retains the sole and exclusive right to make all managerial and other decisions regarding its wastewater facilities, including but not limited to those decisions regarding operation, maintenance, upkeep, expansion, abandonment or replacement of all or a portion of its wastewater facilities.

D. Successors and Assigns. All the covenants contained in this Agreement shall extend to and bind the respective successors and assigns of the Parties hereto with the same effect as if the words "successors and assigns" had, in each case, been specifically mentioned.

E. Waiver. The failure of either City or DELCORA to insist upon strict performance of this Agreement or of any of the terms or conditions hereof shall not be construed as a waiver of any of its rights herein granted, unless specifically stated in this Agreement.

F. Captions. The captions in this Agreement are for convenience only and are not part of the Agreement. The captions do not in any way define, limit, describe or amplify the provisions of this Agreement or the scope or intent thereof.

G. Entire Agreement. This Agreement and its Exhibits and Addendum, incorporated herein, represent the entire agreement of the Parties hereto and there are no collateral or oral agreements or understandings. This Agreement may be amended or modified only in writing signed by both City and DELCORA. This Agreement supersedes all previous wastewater agreements between City and DELCORA.

H. Severability. In the event any provision hereof is held illegal or invalid, no other provision of this Agreement shall be affected; and this Agreement shall then continue in full force as if such illegal or invalid provision had not been contained herein.

I. Notices. All notices, payments and communications required to be given in writing under this Agreement shall be sent by certified United States mail, postage prepaid and by email communication or delivered by hand delivery with receipt obtained, to the addresses below or at such other addresses as City or DELCORA may designate in writing from time to time:

If intended for City:

Water Commissioner
City of Philadelphia Water Department
1101 Market Street, 5th Floor
Philadelphia, PA 19107

If intended for DELCORA:

Executive Director
DELCORA
100 E. Fifth Street
Chester, PA 19016

IN WITNESS WHEREOF, The City of Philadelphia has caused this Agreement to be executed by its Water Commissioner, and the Chairman of the Board of Directors has executed this Agreement on behalf of the Delaware County Regional Water Quality Control Authority, as of the day and year first above written.

CITY OF PHILADELPHIA

By:_____
Howard Neukrug
Commissioner, Philadelphia Water Department

Approved as to form:

By:_____
Gerald D. Leatherman
Divisional Deputy City Solicitor

DELAWARE COUNTY REGIONAL WATER QUALITY CONTROL AUTHORITY

By:_____
Stanley R. Kester
Chairman, Board of Directors

Attest:

_____
David G. Gorbey
Secretary

EXHIBIT "A"

FLOW AND LOADINGS LIMITS ADDENDUM

Flow Limits:

MAXIMUM ANNUAL AVERAGE FLOW LIMIT (over any 365 consecutive day period): 50 MGD

INSTANTANEOUS FLOW LIMIT (As determined over any five (5) consecutive minute period):
155 cfs, or restated as 100 MGD

MAXIMUM DAY FLOW LIMIT (As determined over any 24 consecutive hour period):
75 Million Gallons

Annual Limits of Suspended Solids "SS" and Biochemical Oxygen Demand "BOD":

SS: 19,487,000 pounds (As determined over any 365 consecutive day period)

BOD: 21,771,000 pounds (As determined over any 365 consecutive day period)

EXHIBIT "B"

EXCEEDANCE CHARGE ADDENDUM

DELCORA hereby agrees to exert its best efforts in ensuring that the limits established herein are not exceeded. DELCORA hereby recognizes the City's desire to avoid or eliminate any exceedances of the parameters below and that such exceedances can create significant operating difficulties for the City and the possibility of significant increased capital and operating costs as well as fines.

DELCORA shall be liable to City for the following exceedances beginning upon the Effective Date of this Agreement and thereafter when its flows and/or loadings exceed the limits set forth in the Flow and Loadings Limits Addendum (Exhibit "A"):

Annual Average Flow Exceedance Charge. The annual average flow exceedance charge shall be at the rate of One Hundred Dollars ($100.00) per hundred thousand (100,000) gallons for any flow over the Annual Average Flow Limit during any 365 consecutive day period. The unit of flow used to determine exceedances shall be each hundred thousand gallons, or part thereof, of wastewater flow per day. DELCORA shall be assessed exceedance charges for each period described in Exhibit "A" in which flows exceed the stated limit.

Annual Loadings Exceedance Charges. The annual loadings exceedance charges shall be Seven Hundred Dollars ($700.00) for each one thousand pounds of BOD and Seven Hundred Dollars ($700.00) for each one thousand pounds of SS, delivered by DELCORA in excess of the respective stated annual loadings limit. DELCORA shall be assessed exceedance charges for each period described in Exhibit "A" in which the annual loadings limits are exceeded.

Instantaneous Flow Exceedance Charge. The instantaneous flow exceedance charge shall be at the rate of One Thousand Dollars ($1,000.00) per year per hundred thousand (100,000) gallons per day for any flow above the Instantaneous Flow Limit determined over any five (5) consecutive minute period payable in full as part of the next billing statement. Should the Instantaneous Flow Limit be

exceeded more than once in a calendar month, DELCORA shall be billed only for the highest monthly exceedance. The difference between a higher amount of instantaneous flow experienced in any subsequent month during the remainder of a fiscal year and the previously billed maximum instantaneous flow will also be subject to the instantaneous flow exceedance charge and payable in full as part of the subsequent monthly billing statement. The maximum instantaneous flow will be reestablished at the beginning of each subsequent fiscal year at the contract level set forth in Exhibit "A".

Maximum Day Exceedance Charge. The Maximum Day exceedance charge shall be at the rate of One Thousand Five Hundred Dollars ($ 1,500.00) per hundred thousand (100,000) gallons per day for any daily flow over the Maximum Day Limit over any twenty four consecutive hourly period payable in full as part of the next billing statement. Should the Maximum Day Limit be exceeded more than once in a calendar month, DELCORA shall be billed only for the highest monthly exceedance. The difference between a higher amount of maximum day flow recorded by City in any subsequent month during the remainder of a fiscal year and the previously billed maximum day flow will also be subject to the Maximum Day exceedance charge and payable in full as part of the subsequent monthly billing statement. The Maximum Day flow will be re-established at the beginning of each subsequent fiscal year at the contract level set forth in Exhibit "A".

I. Application of Exceedance Charges.

Exceedance charges shall be billed monthly in accordance with the terms and conditions stated above and in Section IV.B of the Agreement.

. Instantaneous Flow Limit Exemption

The City recognizes that the Instantaneous Flow Limit could be violated during extreme wet weather events. Therefore, the Parties agree that DELCORA shall not be held in violation of this Agreement should it exceed its Instantaneous Flow Limit as a result of a wet weather event that meets the condition set forth below. A wet weather event that exceeds the exemption condition as set forth below and results in DELCORA exceeding its Instantaneous Flow Limit shall be considered an exemption to the Instantaneous Flow Limit and DELCORA shall not incur

instantaneous flow exceedance charges. However, a wet weather event that does not exceed the exemption condition as set forth below and results in DELCORA exceeding its Instantaneous Flow Limit shall be considered a violation of the Agreement and shall result in DELCORA incurring exceedance charges. This exemption does not relieve DELCORA of the requirements of Section III F of this Agreement.

The exemption condition is as follows: A rain event must exceed 2.75 inches in a 24 consecutive hour period. Once the 24 consecutive hour period has been established, the Instantaneous Flow Limit must be met within 48 hours from the start of the defined 24 hour rainfall period or it will be considered a separate exceedance and thereby not qualify for this exemption. At no point shall two 24 hour periods overlap. All such events shall be quantified using hourly precipitation data obtained from the Philadelphia International Airport Rain Gauge

II. Phase-In of Exceedance Charges.

a. DELCORA shall be liable for exceedance charges during the first year succeeding the Effective Date at 33.3 % of the amounts calculated in accordance with this Agreement.
b. DELCORA shall be liable for exceedance charges during the second year succeeding the Effective Date at 66.7 % of the amounts calculated in accordance with this Agreement.
c. For exceedances occurring after two years and zero days after the Effective Date , DELCORA shall be liable at 100 % of the amounts calculated in accordance with this Agreement.

III. Charges for Years Subsequent to Calendar Year 2011

During calendar year 2012, and for each calendar year thereafter, the exceedance charges stated above will be adjusted in accordance with the changes in the Consumer Price Index for the prior calendar year, upon the availability of the Consumer Price Index for January of each subsequent year. The index to be used for this adjustment shall be the Consumer Price Index published by the U.S. Bureau of Labor Statistics for all urban consumers ("CPI-U") for the Northeast Region US, all items.

EXHIBIT "C"

INTERJURISDICTIONAL PRETREATMENT AGREEMENT
BETWEEN
THE CITY OF PHILADELPHIA
AND
DELCORA

RECITAL

Whereas, City owns and operates wastewater collection and treatment facilities; and

Whereas, DELCORA will be utilizing the City's Wastewater Treatment Services pursuant to the attached Service Agreement between City and DELCORA; and

Whereas, City must develop and implement an industrial pretreatment program pursuant to conditions contained in its discharge permits (Permits PA0026671, PA0026689 and PA0026662) issued by the Pennsylvania Department of Environmental Protection; and

Whereas, DELCORA desires to continue to utilize the City's Wastewater Treatment Services and recognizes its industrial waste control obligations under 40 CFR § 403 and the City's Wastewater Control Regulations.

In consideration of the following terms and conditions City and DELCORA agree:

1. No later than four (4) months after the effective date of the City's current Wastewater Control Regulations, DELCORA shall adopt and diligently enforce rules and regulations (hereinafter "Regulations") substantially identical to the City's current Wastewater Control Regulations. DELCORA shall ensure that all of its contributing municipalities then adopt DELCORA's rules and regulations. Should the City amend its Wastewater Control Regulations, DELCORA shall adopt and diligently enforce the amendment within four (4) months from the amendment's effective date. Also, DELCORA shall make its best efforts to ensure that any outside jurisdictions which contribute to its sewer system adopt the Regulations and any amendments to the Regulations within four (4) months of the amendment's effective date.

2. DELCORA shall explicitly incorporate the following provisions into its Regulations:

(a) a provision requiring any Industrial User responsible for any accidental discharge to notify both City and DELCORA immediately;

(b) a prohibition on the use of dilution as a control technique for compliance with discharge limits except as allowed by federal pretreatment standards;

(c) a grant of authority to impose mass discharge limits in lieu of, or in conjunction with, concentration discharge limits;

(d) a prohibition against, and a penalty for, the knowing transmittal of false information by an Industrial User to either City or DELCORA; and

(e) a grant of explicit authority to City to require the Industrial User(s) to install monitoring and pretreatment facilities as necessary.

3. City and DELCORA shall periodically, at a minimum of every five (5) years, review their respective regulations and jointly draft and adopt equivalent amendments where necessary to ensure the effective administration and operation of the pretreatment program. Whenever City revises its regulations or drafts an amendment to its regulations, DELCORA must adopt substantially in such form within three (3) months of promulgation by the City. If DELCORA has adopted regulations identical to the City's regulations, then, whenever City revises or amends its regulations, DELCORA shall adopt the identical revisions or amendment(s) within three (3) months of promulgation by the City.

4. DELCORA shall adopt, as part of its regulations, and enforce specific discharge limits at least as stringent as the specific discharge limits established in City regulations.

5. DELCORA's Regulations shall require that categorical pretreatment standards promulgated by the U.S. Environment Protection Agency (EPA) by authority of the Clean Water Act Sections 307(b) and (c) be automatically incorporated by reference into DELCORA's Regulations. These standards shall supersede any specific discharge limits in the ordinance which are less stringent than the categorical standards as they apply to the particular industrial subcategory. DELCORA shall notify all affected Industrial Users of pertinent categorical standards and monitoring and reporting requirements contained in 40 CFR 403.12 or included as part of the categorical standards.

6. DELCORA shall adopt in its Regulations definitions for "Significant Industrial User," "Industrial User" and "Non-domestic User" which are identical to the definitions adopted

by City. City may make the final determination as to whether a particular user is a Significant Industrial User, Industrial User or Non-domestic User based on information City may request from DELCORA. City may control, through wastewater discharge permits, wastewater discharges from Significant Industrial User, Industrial User or Non-domestic User.

7. If there exists any Industrial User discharging to DELCORA's force main but located outside the jurisdictional limits of DELCORA, then DELCORA shall within thirty (30) days from the effective date of this Service Agreement notify such jurisdiction of the requirements contained within this Interjurisdictional Pretreatment Agreement and provide the City with copies of such notification. DELCORA shall negotiate and enter into an agreement with such outside jurisdiction within six (6) months from the effective date of this Service Agreement. Such agreement shall be substantially equivalent to this Interjurisdictional Pretreatment Agreement, and shall be jointly executed by DELCORA, City and the outside jurisdiction. The agreement shall specifically state that the contributing jurisdiction must also adopt regulations substantially identical to the City's Wastewater Control Regulations and shall adopt all amendments thereto within three (3) months from their effective date. Such agreement shall ensure that the City has the same rights, powers and authority to operate its industrial pretreatment program in the outside jurisdiction as it has within the area served by DELCORA. If DELCORA is unable to reach agreement with the contributing jurisdiction within six (6) months, then DELCORA shall immediately thereafter take all necessary steps to prevent all discharges from Industrial Users within the contributing jurisdiction to DELCORA.

8. DELCORA shall file with City a certified copy of its resolution and any amendments thereto, and other interjurisdictional agreements. DELCORA warrants that its resolution has met EPA approval, and during the term of this Agreement it shall not amend its resolution absent EPA approval. DELCORA shall provide a table to the City cross-referencing sections of its ordinance with the City's Wastewater Control Regulations in order to demonstrate that all provisions contained in the City's Wastewater Control Regulations have been incorporated into DELCORA's ordinance. If DELCORA maintains, DELCORA shall provide City access to and copies of, if requested, all industrial monitoring reports including 40 CFR §403.12 compliance reports, self-monitoring reports, baseline monitoring reports, records of violations and actions taken, and any other monitoring or reporting requirements imposed by federal, state or local

regulations. These records and other relevant information shall be maintained for at least six (6) years.

9. Any authorized officer or employee of City may enter and inspect at any reasonable time any part of the sewer systems of DELCORA and its contributing jurisdictions. The right of entry and inspection shall extend to public streets, easements, and property within which the system is located. Additionally, City shall be permitted, as appropriate, to enter onto private property to inspect wastewater discharges. DELCORA shall provide complete sets of sewer plans and make all necessary legal and administrative arrangements for these inspections. The right of inspection shall include on-site inspection of pretreatment and sewer facilities, observation, measurement, sampling, testing, and access to (with the right to copy) all pertinent compliance records located on the premises of the Industrial User or Non-domestic Dischargers.

10. DELCORA and City hereby agree that DELCORA shall implement a pretreatment program within the area served by DELCORA and its contributing jurisdictions and shall perform in connection therewith technical and administrative activities which may include: 1) updating the industrial waste survey; 2) providing technical services, such as sampling, process chemical analysis, and engineering advice; 3) permitting; 4) compliance monitoring; 5) enforcement; and 6) monitoring hazardous waste disposal practices.

11. City shall review DELCORA's ordinance and amendments thereto, and any interjurisdictional agreements for conformance with 40 CFR Part 403, and to ensure inclusion of all other legal provisions mandated by this Interjurisdictional Pretreatment Agreement. City shall periodically review the enforcement efforts of DELCORA and any other jurisdiction to ascertain whether pretreatment requirements are being diligently enforced.

12. If DELCORA fails or refuses to fulfill any pretreatment obligations, including, but not limited to, any obligations contained within this Interjurisdictional Pretreatment Agreement, City may develop and issue a remedial plan containing a description of the nature of the pretreatment deficiencies, an enumeration of steps to be taken by DELCORA, and a time schedule for attaining compliance with all pretreatment requirements. Such plans shall be specifically enforceable in a court of competent

jurisdiction. Where DELCORA fails to satisfy the terms of the remedial plan, City may, upon thirty (30) days written notice, refuse to accept any wastewater discharges from DELCORA.

13. In the event that EPA or PADEP action results in fines, penalties or costs being assessed against City because of industrial or non-domestic waste discharged from DELCORA or contributing jurisdictions, DELCORA and City shall equitably apportion responsibility for payment of such fines, penalties or costs.

14. Where a discharge to the wastewater collection and treatment facilities reasonably appears to present an imminent danger to the health and welfare of persons, or presents or may present an imminent danger to the environment, or threatens to interfere with the operation of the wastewater collection and treatment facilities, City may immediately initiate steps to identify the source of the discharge and to hold or prevent said discharge. City may seek injunctive relief and/or may pursue other self-help remedies against DELCORA, contributing jurisdictions, and any Industrial User or Non-domestic User contributing to the emergency conditions. DELCORA shall pay to City the cost of such steps specified in reasonable detail and submitted in writing to DELCORA taken to prevent, stop or ameliorate the effects of such discharge.

15. All provisions of this Interjurisdictional Pretreatment Agreement apply only to areas and properties within DELCORA's service area from which flows, directly or indirectly, enter the City's wastewater collection or treatment facilities. This Interjurisdictional Pretreatment Agreement does not apply to any area or property within DELCORA's service area from which flows do not enter the City's wastewater collection or treatment facilities.

16. Any disputes arising out of this Interjurisdictional Pretreatment Agreement shall be submitted to binding arbitration performed in accordance with the procedures set forth in the Service Agreement between DELCORA and City, as amended.

17. The terms of this Interjurisdictional Pretreatment Agreement may be amended only by written agreement of the Parties. In any event, this Interjurisdictional Pretreatment Agreement shall be reviewed and revised, as necessary, at least every five (5) years.

18. This Interjurisdictional Pretreatment Agreement modifies only those provisions of the existing Service Agreement between the two parties which conflict with the terms of this Interjurisdictional Pretreatment Agreement.

19. This Interjurisdictional Pretreatment Agreement will remain in effect so long as the Service Agreement remains in effect. Termination of the Service Agreement shall also result in the termination of this Interjurisdictional Pretreatment Agreement.

IN WITNESS WHEREOF, The City of Philadelphia has caused this Interjurisdictional Pretreatment Agreement to be executed by its Water Commissioner, and the Chairman of the Board of Directors of DELCORA has executed this Interjurisdictional Pretreatment Agreement on behalf of DELCORA, as of the Effective Date of the Service Agreement.

CITY OF PHILADELPHIA

By:_____
Howard Neukrug
Water Commissioner

Approved as to form:

By:_____
Gerald D. Leatherman
Divisional Deputy City Solicitor

DELCORA

Stanley R. Kester
Chairman, Board of Directors

David G. Gorbey
Secretary

Exhibit "D"

The following eleven (11) tables constitute Exhibit D.

TABLE A - 15

UNITS OF WASTEWATER SERVICE
Test Year 2011

Line No.		(1) Units	(2) DELCORA
	FY 2011 Test Year		
	Volume		
1	Sanitary Wastewater	(Mcf)	1,404,000
2	Infiltration	(Mcf)	0
3	Total	(Mcf)	1,404,000
	Suspended Solids		
4	Sanitary Wastewater	(1,000 lbs)	12,528
5	Infiltration	(1,000 lbs)	0
6	Total	(1,000 lbs)	12,528
	BOD		
7	Sanitary Wastewater	(1,000 lbs)	11,214
8	Infiltration	(1,000 lbs)	0
9	Total	(1,000 lbs)	11,214
	Contract Maximum Units		
	Capacity		
10	Sanitary Wastewater	(Mcf/day)	13,392
11	Infiltration	(Mcf/day)	0
12	Total	(Mcf/day)	13,392
	Volume		
13	Sanitary Wastewater	(Mcf)	2,439,840
14	Infiltration	(Mcf)	0
15	Total	(Mcf)	2,439,840
	Suspended Solids		
16	Sanitary Wastewater	(1,000 lbs)	21,771
17	Infiltration	(1,000 lbs)	0
18	Total	(1,000 lbs)	21,771
	BOD		
19	Sanitary Wastewater	(1,000 lbs)	19,487
20	Infiltration	(1,000 lbs)	0
21	Total	(1,000 lbs)	19,487

Mcf - thousand cubic feet
Mcf/day - thousand cubic feet per day
lbs - pounds

TABLE A - 3

ALLOCATION OF TEST YEAR INVESTMENT FOR THE SOUTHWEST WATER POLLUTION CONTROL PLAN TO FUNCTIONAL COST COMPONENTS
Test Year 2011

Line No.	Description	(1) Total Investment (a)	(2) Retail Capacity	(3) Retail, DELCORA, Lower Merion, Springfield (excluding Wyndmoor), and Upper Darby Volume	(4) Capacity	(5) Suspended Solids	(6) BOD
		$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
	NON-WATER POLLUTION ABATEMENT PROGRAM FACILITIES						
1	Raw Wastewater Pumping Station	6,841	6,841				
2	Sludge Digestion Facilities	5,132				3,745	1,387
3	Scum Incineration	1,965				1,965	
4	Settling Tanks	13,122		13,122			
5	Sludge Handling	2,198				1,649	549
6	Chlorination Facilities	1,228			1,228		
7	Aeration Tanks	707					707
8	Oxygen Supply	1,286					1,286
9	Effluent Pump Station	101			101		
10	Sludge Thickener Building	1,936				968	968
11	Composting Facilities	1,033				775	258
12	Sludge Gas Facilities	3,055				2,291	764
13	Subtotal	38,604	6,841	13,122	1,329	11,393	5,919
14	Administrative and General Facilities						
15	Administrative and General Plant	47,979					
16	Land	694					
17	Subtotal	48,673	8,625	16,545	1,676	14,365	7,462
18	Adjustment for Joint Use Facilities	(2,935)				(2,325)	(610)
19	Total Non-Water Pollution Abatement Program Facilities	84,342	15,466	29,667	3,005	23,433	12,771
20	WATER POLLUTION ABATEMENT PROGRAM FACILITIES						
21	Influent Pumping Station	6,386	6,386				
22	Preliminary Treatment Building	24,513			24,513		
23	Primary Sedimentation Tanks	11,248		11,248			
24	Aeration Tanks	16,566					16,566
25	Oxygen Supply System	14,248					14,248
26	Compressor Building	3,771					3,771
27	Final Tanks	29,630		29,630			
28	Scum Concentration Building	1,387				1,387	
29	Sludge Thickener Building	12,682				6,341	6,341
30	Sludge Digestion Facilities	31,442				22,942	8,500
31	Effluent Pumping Station	5,990			5,990		
32	New Centrifuges	11,167				8,148	3,019
33	Composting Facilities	21,811				16,359	5,452
34	Sludge Dewatering	9,075				6,806	2,269
35	Sludge Gas Facilities	7,325				5,345	1,980
36	Subtotal	207,241	6,386	40,878	30,503	67,328	62,146
37	Admin. and Gen'l. Facilities	34,355	1,059	6,776	5,057	11,161	10,302
38	Adjust. for Joint Use Facilities	(10,345)			(474)	(7,385)	(2,486)
39	Total Water Pollution Abatement Program Facilities	231,251	7,445	47,654	35,086	71,104	69,962
40	TOTAL SOUTHWEST WPC PLANT BOOK COST	315,593	22,911	77,321	38,091	94,537	82,733
41	Less Federal Grants	158,028	5,089	32,557	23,980	48,586	47,816
42	ADJUSTED TOTAL SOUTHWEST WPC PLANT INVESTMENT	157,565	17,822	44,764	14,111	45,951	34,917

(a) Plant investment as of 6/30/2007.

TABLE A - 5

TEST YEAR INVESTMENT IN THE WASTEWATER SYSTEM
SUMMARY OF ALLOCATIONS TO FUNCTIONAL COST COMPONENTS
Test Year 2011

Line No.	Cost Component	Total Direct Investment (a)
		$
	COLLECTION SYSTEM	
1	Sewers - Capacity	1,000,622,000
2	Pumping Stations - Capacity	29,222,000
3	Total Collection System	1,029,844,000
	WATER POLLUTION CONTROL PLANTS	
	Southwest Plant:	
4	Retail - Capacity	17,822,000
	Retail, DELCORA, Lower Merion, Springfield, (excluding Wyndmoor), and Upper Darby	
5	Volume	44,764,000
6	Capacity	14,111,000
7	Suspended Solids	45,951,000
8	BOD	34,917,000
9	Total Southwest Plant	157,565,000
10	Other Plants	381,920,000
11	Total Water Pollution Control Plants	539,485,000
12	**Total Investment**	**1,569,329,000**

(a) Plant investment as of 6/30/2007. Includes Administration and General costs.

TABLE A - 16

WATER POLLUTION CONTROL PLANT INVESTMENT PER UNIT OF CAPACITY
Test Year 2011

Line No.	Cost Component	(1) Direct Investment (a)	(2) Units of Capacity	(3) Unit Investment (a)	
		$		$	
	Southwest Water Pollution Control Plant				
1	Retail - Capacity	17,822,000	50 mgd = 6,684 Mcf/day	2,666.3674	/Mcf/day
	Retail, DELCORA, Lower Merion, Springfield, (excluding Wyndmoor), and Upper Darby				
2	Volume	44,764,000	73,000 mg = 9,759,000 Mcf	4.5869	/Mcf
3	Capacity	14,111,000	400 mgd = 53,476 Mcf/day	263.8754	/Mcf/day
4	Suspended Solids	45,951,000	133,824,000	343.3698	/1,000 lbs
5	BOD	34,917,000	83,723,000	417.0520	/1,000 lbs

(a) Plant investment as of 6/30/2007. Includes Administration and General costs.

mg - million gallons

mgd - million gallons per day

Mcf - thousand cubic feet

Mcf/day - thousand cubic feet per day

lbs - pounds

TABLE A - 21

WASTEWATER SYSTEM INVESTMENT
ALLOCATED TO
DELCORA
Test Year 2011

Line No.	Cost Component	Units	Investment Per Unit	Number of Contract Units	Infiltration/Inflow Capacity Allocation Factor	Allocated Investment (a)	Allocated Investment Rounded (a)
			$			$	$
	Treatment						
	Retail, DELCORA, Lower Merion, Springfield, (excluding Wyndmoor), and Upper Darby						
1	Volume	Mcf	4.5869	2,439,840		11,191,302	11,191,000
2	Capacity	Mcf/day	263.8754	13,392		3,533,819	3,534,000
3	SS	1,000 lbs	343.3698	21,771		7,475,504	7,476,000
4	BOD	1,000 lbs	417.0520	19,487		8,127,092	8,127,000
5	Total Treatment					30,327,717	30,328,000
6	Conveyance					0	0
7	**Total Allocated System Investment**					**30,327,717**	**30,328,000**

(a) Plant investment as of 6/30/2007. Includes Administration and General costs.
cfs - cubic feet per second
Mcf - Thousand cubic feet
lbs - pounds

TABLE A - 8

ALLOCATION OF TEST YEAR OPERATION AND MAINTENANCE EXPENSE FOR THE SOUTHWEST WPC PLANT TO FUNCTIONAL COST COMPONENTS
Test Year 2011

Line No.	Description	(1) Total Operation & Maintenance Expense	(2) Retail Volume	(3) Retail Capacity	(4) Retail, DELCORA, Lower Merion, Springfield (w/o Wyndmoor) and Upper Darby Volume	(5) Retail, DELCORA, Lower Merion, Springfield (w/o Wyndmoor) and Upper Darby Capacity	(6) Suspended Solids	(7) BOD
		$	$	$	$	$	$	$
	Personal Services							
1	Raw Wastewater Pumping	145,950		145,950				
2	Preliminary Treatment	1,926,542			1,406,376	520,166		
3	Flocculation	350,280			350,280			
4	Primary Sedimentation	507,906			507,906			
5	Aeration	1,033,327						1,033,327
6	Secondary Sedimentation	875,701			875,701			
7	Recirculating Pumping	326,928			326,928			
8	Chlorination	496,230			292,776	203,454		
9	Effluent Pumping	408,660				408,660		
10	Primary Sludge Pumping	373,632					373,632	
11	Secondary Sludge Thickening	309,414					151,613	157,801
12	Sludge Digestion	1,182,196					886,647	295,549
13	Sludge Holding Tanks	201,411					151,058	50,353
14	Sludge Dewatering	919,486					689,615	229,871
15	Sludge Lagoon	8,757					6,568	2,189
16	Grit and Screening Incineration	810,023			550,816	259,207		
17	Scum and Grease Incineration	205,789					205,789	
18	Laboratory	747,265					373,633	373,632
19	Subtotal Personal Services	10,829,497		145,950	4,310,783	1,391,487	2,838,555	2,142,722
	Purchase of Services, Materials, Supplies, and Equipment:							
20	Raw Wastewater Pumping	34,685		34,685				
21	Preliminary Treatment	397,060				397,060		
22	Flocculation	205,797			205,797			
23	Primary Sedimentation	115,947			115,947			
24	Aeration	225,948						225,948
25	Secondary Sedimentation	243,455			243,455			
26	Recirculating Pumping	101,412			101,412			
27	Chlorination	1,018,059			1,018,059			
28	Effluent Pumping	11,562				11,562		
29	Primary Sludge Pumping	130,481					130,481	
30	Secondary Sludge Thickening	23,123					11,330	11,793
31	Sludge Digestion	228,177					171,133	57,044
32	Sludge Holding Tanks	80,518					60,389	20,129
33	Sludge Dewatering	482,368					361,776	120,592
34	Sludge Lagoon	4,459					3,344	1,115
35	Grit and Screening Incineration	102,073				102,073		
36	Scum and Grease Incineration	32,703					32,703	
37	Laboratory	260,633					130,317	130,316
38	Subtotal Purchase of Services, Materials, Supplies & Equipment	3,698,460		34,685	1,684,670	510,695	901,473	566,937
39	Subtotal All Above	14,527,957		180,635	5,995,453	1,902,182	3,740,028	2,709,659
	Administrative & General							
40	Personal Services	2,622,000		35,337	1,043,712	336,902	687,261	518,788
41	Other	410,800		3,853	187,122	56,725	100,128	62,972
42	Subtotal Administration & General	3,032,800		39,190	1,230,834	393,627	787,389	581,760
	Power Requirements							
43	Raw Wastewater Pumping	94,733	80,523	14,210				
44	Preliminary Treatment	6,316			5,369	947		
45	Flocculation	303,597			258,057	45,540		
46	Primary Sedimentation	23,909			20,323	3,586		
47	Aeration	2,957,928						2,957,928
48	Secondary Sedimentation	60,900			51,765	9,135		
49	Recirculating Pumping	161,497			137,272	24,225		
50	Chlorination	13,082			11,120	1,962		
51	Effluent Pumping	39,698			33,743	5,955		
52	Primary Sludge Pumping	3,609					3,609	
53	Secondary Sludge Thickening	395,172					193,634	201,538
54	Sludge Digestion	92,365					69,274	23,091
55	Sludge Dewatering	67,666					50,750	16,916
56	Grit and Screening Incineration	41,953			35,660	6,293		
57	Scum and Grease Incineration	6,428					6,428	
58	Subtotal Power Requirements	4,268,853	80,523	14,210	553,309	97,643	323,695	3,199,473
59	Sludge Disposal	9,158,748					6,869,061	2,289,687
60	Total Southwest WPC Plant Expense	30,988,358	80,523	234,035	7,779,596	2,393,452	11,720,173	8,780,579

TABLE A - 11

TEST YEAR OPERATION AND MAINTENANCE EXPENSE
SUMMARY OF ALLOCATIONS TO FUNCTIONAL COST COMPONENTS
Test Year 2011

Line No.	Cost Component	(1) Direct Operation & Maintenance Expense	(2) Administrative & General Expense	(3) Total Operation & Maintenance Expense	(4) O&M Expense Deductions Less Interest Income	(5) Less PA Clean Streams Grants	(6) Net Operation & Maintenance Expense
		$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
	COLLECTION SYSTEM						
	Sewer Maintenance						
1	All Customers - Capacity	23,041	10,994	34,035	127	0	33,908
	Inlet Cleaning						
2	Retail - Storm Capacity	10,350	4,938	15,288	57	0	15,231
	Pumping Stations						
3	Total Volume	2,845	0	2,845	11	0	2,834
4	Total Capacity	11,259	5,131	16,390	61	0	16,329
5	COLLECTION SYSTEM	47,495	21,063	68,558	256	0	68,302
	WATER POLLUTION CONTROL PLANTS						
	Southwest Plant:						
	Retail						
6	Volume	81	0	81	0	0	81
7	Capacity	234	104	338	1	1	336
	Retail, DELCORA, Lower Merion, Springfield (Excluding Wyndmoor), and Upper Darby						
8	Volume	7,780	3,414	11,194	42	45	11,107
9	Capacity	2,393	1,085	3,478	13	14	3,451
10	Suspended Solids	11,822	5,468	17,290	64	73	17,153
11	BOD	8,781	2,652	11,433	43	46	11,344
12	Other Plants	55,694	23,544	79,238	295	321	78,622
13	Total Water Pollution Control Plants	86,785	36,267	123,052	458	500	122,094
14	CUSTOMER COSTS	27,879	13,303	41,182	153	0	41,029
15	**Total Operation & Maintenance Expense**	**162,159**	**70,633**	**232,792**	**867**	**500**	**231,425**

TABLE A - 28

UNIT PUMPING AND TREATMENT OPERATION AND MAINTENANCE EXPENSE APPLICABLE FOR CONTRACT SERVICE
Test Year 2011

Line No.	Cost Component	(1) Net Operating Expense	(2) Projected TY Units of Service		(3) Unit Operating Expense
		$			$/Unit
	WATER POLLUTION CONTROL PLANTS				
	Southwest Plant:				
	Retail, DELCORA, Lower Merion, Springfield (Excluding Wyndmoor), and Upper Darby				
1	Volume	11,107,000	9,271,000	Mcf	1.1980
2	Capacity	3,451,000	56,249	Mcf/day	61.3522
3	Suspended Solids	17,153,000	84,426	1,000 lbs	203.1720
4	BOD	11,344,000	61,300	1,000 lbs	185.0571

NA - Not Applicable
Mcf - thousand cubic feet
Mcf/day - thousand cubic feet per day
lbs - pounds

TABLE A - 33

OPERATING EXPENSE ALLOCATED TO DELCORA Test Year 2011

Line No.	Cost Component	(1) Allocated Investment		(2)		(3) Allocated Operating Expense
		$				$
	Collection System:					
1	Sewer Maintenance (a)	0	x	3.20%		0
		Operating Expense Per Unit		Test Yr. No. of Units		
	SW Treatment Plants:					
	Retail, DELCORA, Lower Merion, Springfield (Excluding Wyndmoor), and Upper Darby					
2	Volume	1.1980	$/Mcf	1,404,000	Mcf	1,681,992
3	Capacity	61.3522	$/Mcf/day	13,392	Mcf/day	821,629
4	Suspended Solids	203.1720	$/1,000 lbs	12,528	1,000 lbs	2,545,339
5	BOD	185.0571	$/1,000 lbs	11,214	1,000 lbs	2,075,230
6	Customer Costs					43,000
7	Total					7,167,190
8	Total - Rounded					7,167,000

(a) Based on investment in sewers serving DELCORA.
Mcf - Thousand cubic feet
lbs - pounds

TABLE A - 40

SUMMARY OF ALLOCATED COST OF SERVICE FOR DELCORA

Description	(1) Allocated Investment (a)	(2) Allocated Depreciable Investment (a)	(3) O&M Expense	(4) Depreciation Expense (b)	(5) Return on Investment (b)	(6) Allocated Cost of Service
	$	$	$	$	$	$
FY 2011	30,328,000	30,194,000	7,167,000	0	0	7,167,000
FY 2012	30,328,000	30,194,000	7,686,000	0	0	7,686,000

(a) Plant investment as of 6/30/2007. Includes Administration and General costs.

(b) DELCORA Depreciation and ROI capital charges shall apply to all applicable capital projects which are completed and in-service after December 31, 2010.

TABLE A - 49

SUMMARY OF CHARGES
DELCORA

	(1)	(2)	(3)	(4)	(5)
		Unit Costs			
Description	Annual Lump Sum	Volume	Capacity (a)	Suspended Solids	BOD
	$	$/Mcf	$/cfs	$/1,000 lbs	$/1,000 lbs
FY 2011	43,000	1.1980	5,301	203.1720	185.0571
FY 2012	43,000	1.2821	5,604	214.6076	203.8065

Mcf - Thousand cubic feet
cfs - cubic feet per second
lbs - pounds

(a) Annual Cost.

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 Fax 610-701-3186
www.westonsolutions.com

8 December 2011

Ms. Kelly A. Sweeney
Municipal Planning and Finance Section
PADEP Southeast Regional Office
2 East Main Street
Norristown, PA 19401

Re: DELCORA Act 537 Plan Update Chester-Ridley Service Area

Dear Ms. Sweeney:

Weston Solutions, Inc. (WESTON®) is submitting the enclosed responses to your letter dated November 16, 2011 containing administrative completeness and technical comments for the Act 537 Plan Update for the Chester-Ridley Service Area, on behalf of The Delaware Regional Water Quality Control Authority (DELCORA) and the Delaware County Planning Department (DCPD).

This Plan Update has been prepared to evaluate alternatives for sewage treatment for customers of the Southwest Delaware County Municipal Authority (SWDCMA). The Study Area is known as the Chester-Ridley Creek Service Area. The Act 537 Plan Update for the Chester-Ridley Creek Service Area has been prepared to address a serious problem at the Baldwin Run Pollution Control Facility (BRPCP) by evaluating alternatives to either upgrade the existing facility or divert flow to DELCORA via a new pump station and force main.

Comment 1: The resubmitted information indicates that the title of the plan has been changed to the Delaware County Sewage Facilities Plan Update – Western Plan of Study: Chester-Ridley Creek Service Area to match the resolutions. A Plan of study is a separate document under sewage facilities planning and an Act 537 Plan Update should not be referred to as a plan of study. RESPONSE: DELCORA and DCPD will restore the title of the Western Delaware County Act 537 Sewage Facilities Plan Update: Chester-Ridley Creek Service Area to the plan. A request has been made to PADEP to allow the existing municipal resolutions to stand because the municipalities clearly intended to adopt the Western Delaware County Act 537 Sewage Facilities Plan Update: Chester-Ridley Creek Service Area, even though the resolutions refer to the Delaware County Sewage Facilities Plan Update – Western Plan of Study: Chester-Ridley Creek Service Area. The resolutions have already been re-done once to add language specifying planning commission review and describing the selected alternative. It will be a hardship to obtain municipal resolutions a third time because of time delays and it will create confusion at the municipal level because the plan content has not changed. PADEP has stated that their counsel and supervisory personnel will be consulted to provide confirmation that the existing resolutions are acceptable.

Kelly Sweeney 12/30/2011
PADEP

Comment 2: Provide a map showing the location of required easements for the new force main. Provide documentation that the easements for the new force main either have been or can be obtained. RESPONSE: During a telephone conference on 22 November 2011, PADEP stated that only maps from the BRPCP to I-95 are required. Mapping of the proposed force main is attached to this response as Comment No. 2 Attachment. The force main can be placed within public rights-of-way on the South side of I-95. Maps showing the proposed force main alignment are attached to this response. DELCORA has the authority to condemn property and obtain easements under Sections 5615 and 5607 (d) (15) of the Municipal Authorities Act (Act 22 of 2001).

DELCORA has submitted information to SEPTA to initiate acquisition of an easement to locate the proposed force main within the Chester Creek Branch right-of-way. SEPTA has indicated that an easement within the Chester Creek Line right-of-way can be obtained upon board approval. A copy of e-mail correspondence with SEPTA discussing acquisition of an easement for the force main in attached to this response in the Comment No. 2 Attachment. Where the alignment leaves the easement (Sheet 19 of 22) it crosses private property including an unused portion of the mobile home development and unused portions of private land held by one owner. It then crosses onto municipally-held land owned by the Delaware County Solid Waste Authority (DCSWA) (established originally as the Delaware County Incinerator Authority in 1954).

Comment 3: DELCORA should provide documentation that Sunoco has accepted any plan to reduce its permitted discharge or explain how the additional 6.66 MGD of flow from SWDCMA will be accommodated at DELCORA's Western Regional Treatment Plant. RESPONSE: During a telephone conference on 22 November 2011 WESTON clarified the comparison between peak flows and average daily flows. The 6.66 MGD is an average daily total projected demand though the year 2035 from SWDCMA. The 15 MGD is the peak daily flow that Sunoco is allowed to discharge to the WRTP without incurring a surcharge. The Agreement of Sales and Service between DELCORA and Sunoco is attached to this response as Comment No. 3 Attachment. The second page of this agreement documents that SUNOCO is allowed to discharge up to 10 MGD average daily flow to the WRTP, based on a monthly average. However, Sunoco's average daily flow for the past five (5) years has not exceeded 6.224 MGD, and is not expected to increase due to the recent announcement that the company is ceasing refining operations effective March 1, 2012. The average daily flow discharged to the WRTP by SEPTA for the years 2007 through 2011 are listed below:

2007 6.01 MGD
2008 5.85 MGD
2009 5.79 MGD
2010 5.73 MGD
2011 6.224 MGD thru September

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PADEP

The WRTP is rated to discharge an average daily flow of 50 MGD, but can operate safely at discharge rates up to 108 MGD. There is no maximum day flow limit in the NPDES permit for the WRTP. If conditions at the plant indicate the potential for hydraulic overload, more flow can be directed to the Philadelphia Southwest Pollution Control Plant (PSWPCP). Adequate capacity at the WRTP to accept the future projected average daily flow of 6.66 MGD from the Chester-Ridley Service Area can be documented if average daily flow values are compared consistently. Considering the 3.6 MGD reserved for unallocated needs in the Act 537 Re-rate Plan for the WRTP, and considering the Average Daily Flow value of 10 MGD from the SUNOCO facility, there is 8.6 MGD available capacity, without considering planned developments contained in the Act 537 Re-rate Plan (prepared in 2006) that did not progress as scheduled due to the economic downturn. Furthermore, with Sunoco consistently discharging around MGD,

Comment 4: Documentation that the potential conflicts with PHMC have been resolved must be submitted to the Department. RESPONSE: The final Phase 1 and Phase 2 Archeological Study is attached to this response as Comment 4 Attachment. This study has been submitted to the PHMC for review and contains a recommendation that no further consideration of archeological resources is necessary within the forced sewer main right-of-way. The force main alignment does not encroach on the location of the former Edward Carter pottery building, which was located on the opposite side of Concord Road from the proposed alignment. The PHMC review letter will be forwarded to PADEP upon receipt.

Comment 5: Copies of all updated pages must be submitted to the Department. Copies of the pages that were edited in response to PADEP comments in the 7 September 2011 review letter are attached to this response as Comment No. 5 Attachment.

Comment 6: A response to Item 26 of the Department's September 7, 2011 letter is required. RESPONSE: The following comprehensive response to the Item 26 in PADEP's September 7th technical comment letter is provided:

a. The following comments relate to upgrading the existing BRPCP:

i. Brookhaven asked that the size of various tanks at the BRPCP be provided to determine if the tanks can meet the desired performance criteria. This has not been addressed.

Response: SWDCMA provided the tank sizes. The schedule of tank sizes is included in this response as Comment 6.a.i Attachment. A sketch plan of the BRPCP dated February 2009 is showing the tank identifications is attached as Comment 6.a.i Attachment.

ii. Brookhaven notes that the cost evaluations for keeping the BRPCP in operation and diverting the flow to DELCORA are inadequate and overly-conservative. The response to Brookhaven indicates that it will cost $28 million to upgrade the BRPCP for nutrient removal and an additional $9 million to operate the plant for the next 10 years. It will cost $12 million to divert the flow to DELCORA. Explain how these figures were calculated.

Response: The detailed cost estimates prepared by WESTON for this project are attached to this response as Comment 6.a.ii Attachment. The $9 million are funds required for currently identified facility and pump station deficiencies by SWDCMA. SWDCMA reported these costs in 2009 dollars to be $8.766M, which was rounded up to $9.0M. These are projects that SWDCMA has been unable to fund given their current revenue sources but will be necessary if the plant is required to continue long-term operations. These cost estimates were compiled into the summary cost estimates found in Section 6 of the report.

iii. Brookhaven indicated that they estimated the cost of upgrading the BRPCP. Their estimate is $7 million. Brookhaven must explain how they calculated this figure. The response to this comment notes that the $7 million to upgrade the plant and the $9 million to operate it for the next 10 years is still more than the $12 million needed to divert the flow to DELCORA's plant. The significant discrepancies in the estimates ($28 million vs. $7 million) needs to be explained.

Response: Weston Solutions, Inc. prepared a rough order of magnitude cost estimate to upgrade the BRPCP to provide tertiary treatment (nitrogen removal). The rough order of magnitude estimate is attached to this response in Comment 6.a.iii Attachment, and is based on addition of denitrifying filters to the existing treatment train. Costs for the denitrifying filters were based on budgetary estimates from similar applications (i.e. the addition of tertiary filtration to an existing process train).

The Brookhaven cost estimate of $7.18M to upgrade the plant is attached as Comment No. 6.a.iii Attachment. Additional information would be needed to perform a detailed comparison of the two estimates, however, based on available information the following initial observations are offered:

- The Brookhaven analysis (page 2) indicates that membrane biofiltration would be used after the secondary clarifiers. Tertiary filtration is not currently provided at the plant and the cost of the membrane biofiltration system does not appear as a line item in the estimate. The cost for

membrane (or other tertiary) filtration is likely to be significant. It is noted that page 4 of the letter states that the plant can be retrofitted to meet the nitrogen limit without the filter, while page 2 indicates that it is needed. It is likely that filtration may be needed to meet a low total phosphorus limit regardless of the nitrogen performance.

- The Brookhaven estimates appear to assume the trickling filter tanks are available for conversion. One trickling filter has been converted to a clarifier and the other is being used to house the activated biofilters.

It should be noted that neither estimate includes improvements to existing systems and facilities. Additional costs (not included in the maintenance spreadsheet attached to this response in Comment No. 6.a.ii Attachment) include repairs and upgrades to the nitrification tanks, improvements to the headworks, and additional costs to upgrade the primary clarifiers and aeration system estimated by SWDCMA to be approximately $2.46M.

b. The following comments relate to diverting sewage flows from the existing BRPCP to the WRTP:

i. Brookhaven asked that a plan showing the footprint of the BRPCP and a plan showing the expected improvements be provided. The response indicates that the Department specifically informed them that such plans were not required. The Department questions whether this is an accurate representation of guidance provided by the Department. It is typical that a plot plan showing the location of the proposed facilities be provided during the review of the Plan. A plot plan should be provided to Brookhaven and to the Department.

Response: The Yard Piping Plan produced by Catania Engineering Associates, dated 1/31/1992 is attached as Comment 6.b.i Attachment. A sketch plan of the BRPCP dated February 2009 is attached as Comment 6.a.i Attachment. The location of the proposed pump station is indicated on Sheet 22 of 22 in the Comment No. 2 Attachment.

ii. Brookhaven is concerned that the estimates for the construction of a new pump station and force main are too low. They have asked for plans showing the project so that they can evaluate the cost estimates. The response indicates that only conceptual engineering has been done. If preliminary plans are available, they need to be provided to Brookhaven and to the Department.

Response: Only conceptual engineering has been performed. There are no preliminary engineering plans. The proposed pump station location is shown on Sheet 22 of 22 in the Comment No. 2 Attachment.

iii. Brookhaven asked that a breakdown of the force main cost by section be provided. This was not provided.

Response: Please see the Comment 6.a.ii Attachment for cost estimate detail. The force main estimate was not compiled by section; this type of detailed estimate is performed after the design is finalized.

iv. Brookhaven is concerned that there will be constraints and obstacles met during the construction of the force main that have not been considered. No response has been provided to this concern.

Response: Contingencies have been built into the cost estimate to cover unforeseen obstacles. Obstacles that have been considered include natural resources and cultural resources, structural limitations of crossing I-95 near the Engle Street Bridge, avoiding private property and existing buildings, structural limitations crossing active rail lines, engineering and cost optimization, and utility conflicts. Any obstacles will be clearly identified during detailed engineering design and will be addressed by the final design.

v. Brookhaven asked if the proposed force main will affect any buildings located near the roadway. This comment was not addressed.

Response: No existing structures will be impacted by the proposed project.

vi. Brookhaven asked if required easements have been evaluated. The response indicates that they are currently working on obtaining all required easements. Identify all easements that will be required to implement this Plan. Please note that easements must be obtained before the Plan will be approved.

Response: Please see response to Comment 2 and Comment No. 2 Attachment.

vii. Brookhaven asked if estimates for easements have been included in the total cost. The response indicates that the cost of easements is included in the 15 percent contingency costs. DELCORA must explain why these costs have not been separated from contingency costs.

Response: The cost of easement cannot be determined until preliminary engineering is completed and a final route alignment is selected. At that time, the extent of non-public parcels that will require easements will be known and costs can be assigned. The conceptual alignment has few non-public parcels so the cost of easements should be covered by the funds identified for contingencies.

viii. Brookhaven asked if bridge structures have affected the proposed routing of the force main. This comment was not addressed.

Response: Attaching to the existing PADOT bridge at Engle Street was considered by the plan. After discussions with PADOT, the current structure crossing I-95 is not suitable to allow this modification. Therefore the bridge structure will be avoided.

ix. Brookhaven indicated that if Alternative 2 is chosen, the BRPCP will close and a reduced customer base will pay for the operation and maintenance of the collection and conveyance lines. Brookhaven needs to explain why they feel the customer base will be reduced as a result of the decommissioning of the BRPCP.

Response: The response from Brookhaven Borough appears on the fourth page of the 17 October 2011 letter from Walton, Mulvena & Associates, attached to this response as Comment No. 6.a.iii Attachment.

x. Brookhaven asked if the effects of removing 4.5 MGD of flow to the aquatic life in Chester Creek were considered. The response indicates that this was not evaluated. An evaluation showing the effects of removing this flow from the Chester Creek needs to be provided.

Response: WESTON analyzed USGS observed average daily flow data and average annual flow data recorded at USGS Station 01477000, located above the outfall, just downstream from the Dutton Mill Road Bridge. The period of record for this gage is 1932 to the present. The minimum annual average flow at this location is 24.6 MGD (38 cubic feet per second) for the year 2002. Terminating the additional average discharge from the BRPCP is equal to a 15.5 percent reduction in average stream flow rate below the plant, in the driest year occurring during the 79-year period of recorded observations. The average daily flow during the period of record is 60.9 MGD (the gage is located upstream of the plant discharge). Removing 4.5 MGD from the average stream flow equates to a 6.9% flow reduction in the stream.

xi. Brookhaven is concerned with the estimates for the construction of the pump station and force main. The response indicates that recent bids for other projects were used as the basis of estimates. Brookhaven asked that the projects' locations and utility interferences faced as part of these projects be provided so that they can determine if the projects are similar to the proposed diversion project. This information was not provided. Brookhaven does not believe that the force main installation on Route 291 is comparable to the proposed force main installation from BRPCP to DELCORA's plant. If DELCORA is using this project as a basis for its estimates, they must show that the projects are comparable.

Response: An independent estimate for the cost of the proposed force main and pump station was performed. The detailed cost estimate for the selected alternative is included in this response as Comment 6.a.ii Attachment.

xii. Brookhaven asked how utility relocations will be paid for and if the owner will be responsible for relocations. Brookhaven asked for cost estimates for relocating utilities. They have not been provided.

Response: Typically designs are engineered to avoid the relocation of existing utilities. There are instances when it is less expensive to relocate a utility that to construct around. Utility relocations are done in full cooperation with the utility. DELCORA will be responsible for costs of any necessary utility relocation.

xiii. Brookhaven does not believe that costs have been included for crossing Baldwin Run, clearing the railway area and revegetating the railway area. There was no response to this comment.

Response: Costs for these project elements is included in the detailed cost estimate attached to this letter as Comment No. 6.a.ii Attachment.

xiv. Brookhaven noted that no estimates have been provided for wetland mitigation. The response indicates that there will be only temporary impacts to wetlands. DELCORA needs to describe these temporary impacts, explain why they believe that they are only temporary and explain if there are costs associated with these temporary impacts.

Response: If wetlands are identified along the proposed force main alignment, impacts can be avoided by boring under the wetlands, or by seeking appropriate

permits to disturb and re-establish the wetlands. If trenching is used to install the force main, the area will be restored to existing conditions. Any wetland impacts will be addressed during the detailed design phase.

c. The following comments relate to available capacity at the WRTP:

i. Brookhaven asked how the new flow from new CDCA members was considered in determining if there is capacity for the proposed diversion. Was the additional flow from CDCA included in existing DELCORA flow or has it been considered separately?

Response: Additional flow from CDCA was included in the previously approved Act 537 for the rerating of the WRTP to 50 MGD. Additionally, DELCORA's system was specifically designed to allow flexibility in how much of the daily flow from CDCA is sent to the WRTP and how much is sent to Philadelphia. Please see also the response to Comment No. 3 above.

ii. Brookhaven commented that the DELCORA plant was rerated to 50 MGD to account for additional flows from new CDCA members and to reduce the amount of flow being sent to Philadelphia. They note that they believe the same rerate is being used to justify capacity for the SWDCMA flows being diverted to the DELCORA plant and asked if flows can be diverted back to Philadelphia when the previous plan called for a decrease in the flows being sent to Philadelphia. This was not addressed.

Response: Please see the response to Comment No. 3 above.

iii. Brookhaven asked if any upgrades to the DELCORA plant would be required if both additional CDCA flows from their new members and SWDCMA flows were sent to DELCORA. The response only indicates that there is available capacity. According to our records, all of the additional capacity in the expansion (6 MGD) has been allocated to other projects and municipalities and there is no capacity included in the 50 MGD plant for the SWDCMA flows. Please explain how DELCORA has determined that there is adequate capacity in the WRTP for the SWDCMA flows.

Response: Please see the response to Comment No. 3 above.

d. The following comments relate to the costs of implementing the Plan:

i. Brookhaven asked if PennVEST loans were available to individuals. The response indicates that PennVEST loans are available to individuals for the repair or replacement of their malfunctioning on-lot sewage disposal system. It is not clear if this adequately addresses Brookhaven's concern.

Response: PennVest funding is available for on-lot system owners. Brookhaven has indicated that this question has been answered adequately.

ii. Brookhaven asked for the phase-out cost of the BRPCP. The response indicates that this information is not included in the Plan, since this is a responsibility of SWDCMA. This information should be included, since the affected municipalities need to evaluate their total costs. SWDCMA indicates that $500,000 will be required to clean the digesters. All other work to decommission the plant will be done over time using operating funds, not borrowing capital. Will the cost to phase-out the plant be passed onto the SWDCMA members or is SWDCMA paying for it directly through money already budgeted for the project? If the members are going to be responsible for paying for the phase-out, will the cost be shared by existing users or all users?

Response: Costs to phase out the BRPCP have been estimated at $3 Million by SWDCMA and amortized over 20 years to an annual cost of $230,697. This value has been divided by 7,327 SWDCMA customers excluding MTSA flows to calculate a conservative per customer estimate of $32 per year over 20 years for decommissioning the BRPCP. If MTSA agrees to participate in decommissioning costs, the cost per customer will decrease.

iii. The letters indicate that Brookhaven will be assessed a fee of $54 per EDU per year for 20 years. Explain the basis for this fee. Also, Brookhaven notes that this fee does not include financing to cover the cost of the decommissioning of the BRPCP. Please confirm this statement. Provide the estimated total annual costs to Brookhaven residents to implement this Plan.

Response: The total annual costs over 20 years to Brookhaven Residents to implement this plan are $54 to construct the proposed force main and $32 to decommission the BRPCP. The cost per customer to construct the pump station and force main were calculated by assuming a 5% interest rate over a period of 20

years to finance the $12 Million cost of Alternative 2C. This payment was divided equally among 18,000 total SWDCMA customers to arrive at $54 annual cost per customer, reported in Chapter 6 of the Act 537 Plan.

iv. Brookhaven has repeatedly questioned the fees associated with closing the BRPCP and diverting flow to the DELCORA plant. DELCORA and SWDCMA need to clearly address this issue.

Response: Please see response to d.iii above.

v. Brookhaven notes that Chester Township will become a part of the DELCORA collection system and SWDCMA will therefore lose approximately 2,000 users. The revenue they are losing from losing those customers will then be split among the remaining users. Brookhaven needs to explain why they believe Chester Township will become part of the DELCORA system. SWDCMA needs to explain what will happen in this situation. Will costs be reallocated among the remaining customers?

Response: SWDCMA will not lose customers that currently flow to the BRPCP in any of the contributing municipalities unless they prepare revisions to their Act 537 Plans and construct pump stations connecting existing infrastructure to a treatment option, or construct new infrastructure. Changes to the collection system or the customer base are not anticipated or included in this Act 537 Plan Update for the Chester-Ridley Service Area. The limits of the Chester-Ridley Service Area are clearly shown in Figure 1-2 of the Plan.

e. The following are additional comments related to the proposed Plan:

i. Brookhaven disagrees with DELCORA's statement that the proposed Eastern Plan has no bearing on the current plant. It has been the Department's practice to accept multiple plans, each of which cover particular sections of the municipality that cumulatively address the sewage disposal concerns for the entire municipality. DELCORA's service area covers a significant portion of Delaware County and it is feasible to separate the planning documents into specific portions of the service area. DELCORA should respond to Brookhaven that the concept of an Eastern Plan is acceptable to the Department and that any effects that the Eastern Plan may have on any other portion of the DELCORA service area will be addressed adequately in the Eastern Plan.

Kelly Sweeney
PADEP

12/30/2011

Response: The concept of an Eastern Service Area Plan is acceptable to PADEP and any effects that the Eastern Plan may have on any other portion of the DELCORA service area will be addressed adequately in the Eastern Plan.

ii. Brookhaven has indicated that they will be willing to adopt the proposed Plan, provided SWDCMA conveys the sewer lines located in Brookhaven to the Borough. Brookhaven will then do planning to send all flows originating in the Borough to their own plant. Please indicate if this option has been considered.

Response: Brookhaven has considered this option. SWDCMA has provided a cost estimate for Brookhaven's consideration to purchase portions of the collection system located within the Borough boundaries. Brookhaven Borough stated at their 25 October 2011 planning commission meeting that getting the collection system at no cost is their hope. This is a negotiation between Brookhaven Borough and SWDCMA and is outside of DELCORA's ability for intercession or influence.

If you have any questions or require additional information, please do not hesitate to contact me at (610) 701-3708. Thank you for your attention,

Very truly yours,

WESTON SOLUTIONS, INC.

Roger W. Lehman, P.E.
Senior Technical Manager

Attachments

cc: C. Volkay-Hilditch (DELCORA)
K. Holm (DCPD)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHEAST REGIONAL OFFICE

September 7, 2011

Mr. Roger W. Lehman, P.E.
Senior Technical Manager
Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, PA 19380

Re: Act 537 Plan Update
Western Delaware County Act 537 Plan Update
for the Chester-Ridley Creek Service Area
Aston, Chester, Edgmont, Middletown, Upper Chichester,
and Upper Providence Townships;
Brookhaven and Chester Heights Boroughs;
and City of Chester
Delaware County

Dear Mr. Lehman:

In an August 2, 2011, meeting with representatives of Southwest Delaware County Municipal Authority (SWDCMA) and Brookhaven Borough (Brookhaven), the Department of Environmental Protection (Department) offered to complete a preliminary technical review of the above-referenced Act 537 Official Plan Update (Plan). In addition to addressing the June 21, 2011, administrative review comments that the Department provided, information that addresses the following technical deficiencies must be submitted to the Department so that we may complete our review. Please be advised that additional comments may be generated, following our review of your submission of information that addresses the administrative comments and the following technical comments:

1. Mapping that identifies the physical characteristics of the sewer service area, including streams, lakes, impoundments, natural conveyance, channels, and drainage basins must be submitted as required by Chapter 71, Section 71.21(a)(1)(ii).

2. Provide mapping of the service area, which identifies wetlands, as defined in Title 25, Chapter 105. Proposed collection, conveyance, and treatment facilities and lines must be located and labeled, along with the identified wetlands, on the map. This information is required under Chapter 71, Section 71.21(a)(1)(v).

3. Delineate and describe through map, text, and analysis, the areas of proposed development and existing development that have not been completed. Include the name, location, total number of equivalent dwelling units (EDUs) in the development, total number of EDUs currently developed, and total number of EDUs remaining to be developed, including a time schedule for EDUs remaining to be developed, for the service area. This information is required under Chapter 71, Section 71.21(a)(3)(i).

4. Delineate and describe through map, text, and analysis, the land use designations established under the Pennsylvania Municipalities Planning Code, including residential, commercial, and industrial areas, as required by Chapter 71, Section 71.21(a)(3)(iv).

5. Provide the estimated user fees for the alternatives considered, as required by Chapter 71, Section 71.21(a)(5)(iv). For the alternative which proposes to decommission the existing SWDCMA Baldwin Run Pollution Control Facility (BRPCP), a cost estimate for the plant's decommissioning must be included.

6. Identify the funding method chosen to finance the decommissioning of the existing BRPCP and the construction of the new pumping station and force main. Identify the contingency financing plan to be used if the preferred method of financing cannot be implemented.

7. Consistent with Chapter 71, Section 71.61(d)(2), describe all necessary administrative and legal activities to be completed and adopted to ensure the implementation of the recommended alternative, including: the incorporation of authorities or agencies; the development of all required ordinances, regulations, standards and intermunicipal agreements; the activities to provide rights-of-way, easements and land transfers; adoption of other municipal sewage facilities plans; any other legal documents; and include the dates or time frames on the project's implementation schedule.

8. The Plan states that the Delaware County Regional Water Control Authority (DELCORA) is responsible for the safe collection, transmission, treatment, and disposal of approximately 94 million gallons per day (MGD) of wastewater generated in southeastern Pennsylvania (1–10). Please explain how the 94 MGD figure was calculated.

9. The Plan states that DELCORA's Western Regional Treatment Plant (WRTP) treats all wastewater from Southern Delaware County Authority (1–10). It is our understanding that the BRPCP accepts wastewater from a portion of the Southern Delaware County Authority service area. Please clarify.

10. The Plan states, "As noted in the Chapter 94 Report, organic capacity is not applicable since the NPDES permit for the plant addresses effluent" (3-3). Although the NPDES permit addresses limitations for effluent quality, the plant's Water Quality Management/Part 2 permit addresses influent parameters. Any exceedance of the design influent organic load constitutes an organic overload. Any projected exceedance of the design influent organic load constitutes a projected organic overload. The Plan must be corrected.

11. The Plan states that DELCORA has a contract with the City of Philadelphia which provides 50 MGD of capacity in the City of Philadelphia Southwest Wastewater Treatment Facility (3-4). Please clarify if the 50 MGD capacity includes the flows being sent to the City of Philadelphia Southwest Wastewater Treatment Facility via the Muckinipates Authority, Darby Creek Joint Authority, Radnor Haverford Marple Sewer Authority, and the Central Delaware County Authority conveyance systems. Provide the current flow being conveyed from these systems to the City of Philadelphia Southwest Wastewater Treatment Facility.

12. The Plan indicates that the SWDCMA owns the collector sewers in the service area, except for those in Middletown Township and those owned by the Southern Delaware County Authority (3-5). According to our records, the following table identifies the permittees of the collection and conveyance systems in the portions of the identified municipalities which are tributary to the BRPCP:

Aston Township	SWDCMA
Brookhaven Borough	SWDCMA
Chester Township	
Chester Heights Borough	
Edgmont Township	
Middletown Township	Middletown Township Sewer Authority
Upper Chichester Township	Southern Delaware County Authority
Upper Providence Township	Upper Providence Township Sewer Authority

Please clarify who currently owns and operates the collection and conveyance systems in Chester Township and Chester Heights Borough. Please clarify who will own and operate the proposed collection and conveyance system in Edgmont Township. Please revise the Plan so that it correctly identifies the entities who own and/or operate collection and conveyance systems tributary to the BRPCP.

13. The Plan indicates that there are undeveloped parcels in the sewer service area that may connect to the sewer system and further states that "without knowing if any are able to subdivide, an accurate estimate of potential flows from future development is now available" (4-1). SWDCMA, DELCORA, and the Delaware County Planning Department must coordinate with the municipalities in which undeveloped parcels are located to review lot sizes, zoning requirements, etc., in order to assure that accurate flows projections are included in the Plan.

14. The Plan indicates that a very small percentage of properties in Aston Township, Middletown Township, and Upper Chichester Township are served by on-lot sewage disposal systems (4-3). Please indicate if capacity has been included for the future connection of these properties.

15. The Plan indicates that there are 5 smaller, older properties in Chester Heights Borough that are served by on-lot sewage disposal systems (4-3). Please indicate if capacity has been included for the future connection of these properties.

16. Please indicate if there are any on-lot sewage disposal systems in Upper Providence Township that are located within the sewer service area. If so, indicate if capacity has been included for the future connection of these properties.

17. The Plan states that permits, easements, and agreements with the railroad owner will be necessary to construct the force main from the proposed pumping station to the WRTP (6-5). Please explain what permits and agreements will be required and provide a map showing the location of the required easements. If any permits, easements, and agreements will be required with parties other than the railroad owner, please provide the information for those parties as well. Provide documentation that the easements have been acquired and the agreements have been executed.

18. The Plan states that the preliminary cost estimates presented for Alternative 2 include only those costs to construct the pumping station and force main and do not include costs to decommission the BRPCP (6-8). Since the Plan proposes to decommission the BRPCP and divert flows to the WRTP, the costs to decommission the BRPCP must be included in the Plan.

19. Please indicate if the industrial pretreatment agreements have been transferred to DELCORA or if a new agreement to allow SWDCMA to administer the program has been prepared. Provide copies of the signed agreements.

20. Page 3-3 of the Plan states that the WRTP has a rated treatment capacity of 44 MGD. Page 6-16 of the Plan states that the WRTP is rated to treat 50 MGD. According to our records, the WRTP is permitted to accept 44 MGD. Sewage facilities planning has been approved to expand the plant to 50 MGD; however, a permit for the expansion has not been issued by the Department. Please revise the Plan so that it is consistent throughout and with the actual permitted capacities.

21. Sewage facilities planning was approved on February 3, 2009, to expand the WRTP from 44 MGD to 50 MGD. The additional 6 MGD that was realized as a result of the expansion was allocated to the City of Chester, Chester Township, Bethel Township, Newtown Township, Edgmont Township, and Upper Providence Township, as indicated in the Department's February 3, 2009, letter (copy attached). In addition, 3,618,730 gpd was reserved for "Unallocated Future Needs." There does not appear to be adequate capacity in the WRTP to allow for the diversion of 6.66 MGD of annual average flow from the BRPCP. Please explain how the 6.66 MGD from the BRPCP can be accommodated without exceeding the permitted flow at the WRTP or reallocating capacity from those municipalities to which capacity was already allocated.

22. The Pennsylvania Historical and Museum Commission (PHMC) indicated in their review of this project that there is a high probability that significant archaeological sites are located in the project area and could be adversely affected by the project activities. PHMC required that a Phase 1 archaeological survey be completed of the project area. Submit documentation that the Phase 1 survey has been completed and that the potential conflicts with resources under the purview of PHMC have been resolved.

23. The PNDI Project Environmental Review Receipt for Project Search ID 20110119278906 identified a potential conflict with species under the purview of the Pennsylvania Department of Conservation and Natural Resources (DCNR). Documentation from DCNR that indicates that the potential conflict has been resolved must be submitted to the Department.

24. Sections 7 and 8 of the PNDI Project Environmental Review Receipt for Project Search ID 20110119278906 must be completed.

25. Sections 7 and 8 of the PNDI Project Environmental Review Receipt for Project Search ID 20110119278891 must be completed.

26. Comments provided by or on behalf of Brookhaven have not been adequately addressed. Responses to the comments below must be provided to Brookhaven. Please include a copy of your response with your resubmission of this project.

    a. The following comments relate to upgrading the existing BRPCP:

        i. Brookhaven asked that the size of various tanks at the BRPCP be provided to determine if the tanks can meet the desired performance criteria. This has not been addressed.

        ii. Brookhaven notes that the cost evaluations for keeping the BRPCP in operation and diverting the flow to DELCORA are inadequate and overly-conservative. The response to Brookhaven indicates that it will cost $28 million to upgrade the BRPCP for nutrient removal and an additional $9 million to operate the plant for the next 10 years. It will cost $12 million to divert the flow to DELCORA. Explain how these figures were calculated.

        iii. Brookhaven indicated that they estimated the cost of upgrading the BRPCP. Their estimate is $7 million. Brookhaven must explain how they calculated this figure. The response to this comment notes that the $7 million to upgrade the plant and the $9 million to operate it for the next 10 years is still more than the $12 million needed to divert the flow to DELCORA's plant. The significant discrepancies in the estimates ($28 million vs. $7 million) needs to be explained.

    b. The following comments relate to diverting sewage flows from the existing BRPCP to the WRTP:

        i. Brookhaven asked that a plan showing the footprint of the BRPCP and a plan showing the expected improvements be provided. The response indicates that the Department specifically informed them that such plans were not required. The Department questions whether this is an accurate representation of guidance provided by the Department. It is typical that a plot plan showing the location of the proposed facilities be provided during the review of the Plan. A plot plan should be provided to Brookhaven and to the Department.

ii. Brookhaven is concerned that the estimates for the construction of a new pump station and force main are too low. They have asked for plans showing the project so that they can evaluate the cost estimates. The response indicates that only conceptual engineering has been done. If preliminary plans are available, they need to be provided to Brookhaven and to the Department.

iii. Brookhaven asked that a breakdown of the force main cost by section be provided. This was not provided.

iv. Brookhaven is concerned that there will be constraints and obstacles met during the construction of the force main that have not been considered. No response has been provided to this concern.

v. Brookhaven asked if the proposed force main will affect any buildings located near the roadway. This comment was not addressed.

vi. Brookhaven asked if required easements have been evaluated. The response indicates that they are currently working on obtaining all required easements. Identify all easements that will be required to implement this Plan. Please note that easements must be obtained before the Plan will be approved.

vii. Brookhaven asked if estimates for easements have been included in the total cost. The response indicates that the cost of easements is included in the 15 percent contingency costs. DELCORA must explain why these costs have not been separated from contingency costs.

viii. Brookhaven asked if bridge structures have affected the proposed routing of the force main. This comment was not addressed.

ix. Brookhaven indicated that if Alternative 2 is chosen, the BRPCP will close and a reduced customer base will pay for the operation and maintenance of the collection and conveyance lines. Brookhaven needs to explain why they feel the customer base will be reduced as a result of the decommissioning of the BRPCP.

x. Brookhaven asked if the effects of removing 4.5 MGD of flow to the aquatic life in Chester Creek were considered. The response indicates that this was not evaluated. An evaluation showing the effects of removing this flow from the Chester Creek needs to be provided.

xi. Brookhaven is concerned with the estimates for the construction of the pump station and force main. The response indicates that recent bids for other projects were used as the basis of estimates. Brookhaven asked that the projects' locations and utility interferences faced as part of these projects be provided so that they can determine if the projects are similar to the proposed diversion project. This information was not provided. Brookhaven does not believe that the force main installation on Route 291 is comparable to the proposed force main installation from BRPCP to DELCORA's plant. If DELCORA is using this project as a basis for its estimates, they must show that the projects are comparable.

xii. Brookhaven asked how utility relocations will be paid for and if the owner will be responsible for relocations. Brookhaven asked for cost estimates for relocating utilities. They have not been provided.

xiii. Brookhaven does not believe that costs have been included for crossing Baldwin Run, clearing the railway area and revegetating the railway area. There was no response to this comment.

xiv. Brookhaven noted that no estimates have been provided for wetland mitigation. The response indicates that there will be only temporary impacts to wetlands. DELCORA needs to describe these temporary impacts, explain why they believe that they are only temporary and explain if there are costs associated with these temporary impacts.

c. The following comments relate to available capacity at the WRTP:

i. Brookhaven asked how the new flow from new CDCA members was considered in determining if there is capacity for the proposed diversion. Was the additional flow from CDCA included in existing DELCORA flow or has it been considered separately?

ii. Brookhaven commented that the DELCORA plant was rerated to 50 MGD to account for additional flows from new CDCA members and to reduce the amount of flow being sent to Philadelphia. They note that they believe the same rerate is being used to justify capacity for the SWDCMA flows being diverted to the DELCORA plant and asked if flows can be diverted back to Philadelphia when the previous plan called for a decrease in the flows being sent to Philadelphia. This was not addressed.

iii. Brookhaven asked if any upgrades to the DELCORA plant would be required if both additional CDCA flows from their new members and SWDCMA flows were sent to DELCORA. The response only indicates that there is available capacity. According to our records, all of the additional capacity in the expansion (6 MGD) has been allocated to other projects and municipalities and there is no capacity included in the 50 MGD plant for the SWDCMA flows. Please explain how DELCORA has determined that there is adequate capacity in the WRTP for the SWDCMA flows.

d. The following comments relate to the costs of implementing the Plan:

i. Brookhaven asked if PennVEST loans were available to individuals. The response indicates that PennVEST loans are available to individuals for the repair or replacement of their malfunctioning on-lot sewage disposal system. It is not clear if this adequately addresses Brookhaven's concern.

ii. Brookhaven asked for the phase-out cost of the BRPCP. The response indicates that this information is not included in the Plan, since this is a responsibility of SWDCMA. This information should be included, since the affected municipalities need to evaluate their total costs. SWDCMA indicates that $500,000 will be required to clean the digesters. All other work to decommission the plant will be done over time using operating funds, not borrowing capital. Will the cost to phase-out the plant be passed onto the SWDCMA members or is SWDCMA paying for it directly through money already budgeted for the project? If the members are going to be responsible for paying for the phase-out, will the cost be shared by existing users or all users?

iii. The letters indicate that Brookhaven will be assessed a fee of $54 per EDU per year for 20 years. Explain the basis for this fee. Also, Brookhaven notes that this fee does not include financing to cover the cost of the decommissioning of the BRPCP. Please confirm this statement. Provide the estimated total annual costs to Brookhaven residents to implement this Plan.

iv. Brookhaven has repeatedly questioned the fees associated with closing the BRPCP and diverting flow to the DELCORA plant. DELCORA and SWDCMA need to clearly address this issue.

v. Brookhaven notes that Chester Township will become a part of the DELCORA collection system and SWDCMA will therefore lose approximately 2,000 users. The revenue they are losing from losing those customers will then be split among the remaining users. Brookhaven needs to explain why they believe Chester Township will become part of the DELCORA system. SWDCMA needs to explain what will happen in this situation. Will costs be reallocated among the remaining customers?

e. The following are additional comments related to the proposed Plan:

i. Brookhaven disagrees with DELCORA's statement that the proposed Eastern Plan has no bearing on the current plant. It has been the Department's practice to accept multiple plans, each of which cover particular sections of the municipality that cumulatively address the sewage disposal concerns for the entire municipality. DELCORA's service area covers a significant portion of Delaware County and it is feasible to separate the planning documents into specific portions of the service area. DELCORA should respond to Brookhaven that the concept of an Eastern Plan is acceptable to the Department and that any effects that the Eastern Plan may have on any other portion of the DELCORA service area will be addressed adequately in the Eastern Plan.

ii. Brookhaven has indicated that they will be willing to adopt the proposed Plan, provided SWDCMA conveys the sewer lines located in Brookhaven to the Borough. Brookhaven will then do planning to send all flows originating in the Borough to their own plant. Please indicate if this option has been considered.

27. As we previously indicated in our June 21, 2011, administrative review letter, the proposed Plan may not be approved unless Brookhaven adopts an Act 537 Plan Update to divert sewage flows generated within Brookhaven from the BRPCP or until Brookhaven adopts the proposed Plan. If Brookhaven elects to adopt the proposed Plan, the Plan must be revised to include information pertaining to Brookhaven, comments from the Brookhaven Borough Planning Commission must be submitted to the Department, along with evidence that the comments received were considered by the municipality, and Brookhaven must adopt the Plan by resolution.

In the Department's approval of the proposed Plan of Study for this project, the Department informed you that the Plan was to be formatted as suggested in "A Guide for Preparing Act 537 Update Revisions." The format of the Plan must be revised so as to be consistent with the above-referenced guide.

When the required information has been submitted, the Department will complete a review in accordance with the provisions of Chapter 71, Administration of the Sewage Facilities Program.

If there are any questions concerning the information required, please contact me at 484.250.5182.

Sincerely,

Kelly A. Sweeney
Sewage Planning Specialist 2
Water Management

cc: Mr. Pickett – Delaware County Planning Department (via e-mail)
Ms. Holm – Delaware County Planning Department (via e-mail)
Ms. Volkay-Hilditch – DELCORA (via e-mail)
Mr. Salvucci – DELCORA (via e-mail)
Mr. Crum – SWDCMA (via e-mail)
Mr. Catania – SDCA
Mr. Lehr – Aston Township (via e-mail)
Ms. McKinley – Brookhaven Borough (via e-mail)
Ms. Mulvena – Walton, Mulvena & Associates (via e-mail)
Mr. Pisarek – Chester Township
Ms. Timmins – Chester Heights Borough (via e-mail)
Ms. Reiner – Edgmont Township (via e-mail)
Mr. Clark – Middletown Township (via e-mail)
Mr. Majeski – Middletown Township Sewer Authority (via e-mail)
Mr. Fazler – Bradford Engineering Associates, Inc. (via e-mail)
Ms. Coleman – Upper Chichester Township (via e-mail)
Mr. Cashman – Upper Providence Township (via e-mail)
Mr. Donze – Upper Providence Township Sewer Authority
Mr. Kelly – Kelly & Close Engineers
Mr. Butler – City of Chester (via e-mail)
Mr. Bram – Office of Chief Counsel (via e-mail)
Mr. Feola – DEP (via e-mail)
Ms. Fields – DEP (via e-mail)
Ms. Mahoney – DEP (via e-mail)
Planning Section
Re 30 (GJS11WQM)250-3

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

SOUTHEAST REGIONAL OFFICE

November 16, 2011

Mr. Roger W. Lehman, P.E.
Senior Technical Manager
Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, PA 19380

Re: Act 537 Plan Update
Western Delaware County Act 537 Sewage Facilities
Plan Update Chester-Ridley Creek Service Area
Aston, Chester, Edgmont, Middletown,
Upper Chichester, and Upper Providence Townships,
Brookhaven and Chester Heights Boroughs, and
City of Chester
Delaware County

Dear Mr. Lehman:

On October 11 and 18, 2011, the Southeast Regional Office of the Department of Environmental Protection ("Department") received additional information pertaining to the above-referenced Act 537 Official Sewage Facilities Plan Update ("Plan"). The information was submitted in response to the Department's September 7, 2011, letter and October 11, 2011, e-mail concerning this project.

We reviewed the resubmitted information and have determined that the submitted Plan is still administratively incomplete.

1. In our June 21, 2011, letter concerning this project, we informed you that the municipalities' Resolutions of Adoption must reference the correct title of the plan, "Western Delaware County Act 537 Sewage Facilities Plan Update – Chester-Ridley Creek Service Area." In our October 11, 2011, e-mail, we again stated that the resolutions are required to reference the correct title of the plan. The resolutions state that they are "Resolutions Adopting the Delaware County Sewage Facilities Plan – Western Plan of Study." The resubmitted information indicates that the title of the plan has been changed to "Delaware County Act 537 Western Plan of Study; Chester-Ridley Creek Service Area Update." As we have previously explained, a plan of study is a separate document under sewage facilities planning. An Act 537 Plan Update should not be referred to as a plan of study.

Resolutions from each of the affected municipalities which reference the appropriate title ("Western Delaware County Act 537 Sewage Facilities Plan Update – Chester-Ridley Creek Service Area") must be submitted.

2. In our September 7, 2011, letter, we requested that you provide: a map showing the location of the required easements for the new force main, if easements other than those required by the railroad owner would be required, and documentation that the easements have been acquired. The response does not provide a map, nor does it indicate if easements other than those from the railroad owner would be required. In response to the third item, the following was provided: "(a)cquiring easements is not required by Act 537; however, necessary easements will be obtained during design." Consistent with Chapter 71, Section 71.21(a)(6), the completed plan submitted to the Department shall select an alternative to solve the need for sewage facilities and support the choice with documentation which shows that the alternative is technically, environmentally, and administratively acceptable. Further, consistent with Chapter 71, Section 71.32(d)(4), the Department must consider whether the plan is able to be implemented. Without providing documentation that the required easements have been, or clearly can be, acquired, the Department questions whether the plan documents that it is technically acceptable and able to be implemented.

   A map showing the location of the required easements must be provided. In addition, please clarify if any easements, other than those from the railroad owner, are necessary to implement the plan. Provide documentation that the easements have been, or clearly can be, acquired. If a required easement has not been obtained, you should explain the authority under which the Delaware County Regional Water Quality Control Authority ("DELCORA") can condemn the needed easements if they are unable to acquire the easements through agreement.

3. In our September 7, 2011, letter, we requested that DELCORA explain how they will accommodate the additional 6.66 MGD of flow from SWDCMA. The response indicates that there is capacity and, in part, explains that Sunoco Marcus Hook Refinery ("Sunoco") is permitted to discharge 15 MGD and only discharges 5.73 MGD. Although Sunoco is discharging significantly less than they are permitted, it appears that Sunoco is still permitted to discharge the full 15 MGD. The 9.27 MGD of capacity may not be utilized as justification of existing capacity within the plant, unless planning is completed and approved by the Department to limit the flow from Sunoco to 5.73 MGD.

DELCORA should provide documentation that Sunoco has accepted any plan to reduce its permitted discharge. Alternatively, please explain how the additional 6.66 MGD of flow from the Southwest Delaware County Municipal Authority ("SWDCMA") will be accommodated within the DELCORA WWTF, since it appears that all available capacity, less the 3.6 MGD reserved for unallocated future needs, has been allocated.

4. In our September 7, 2011, letter, we noted that the Pennsylvania Historical and Museum Commission ("PHMC") indicated that there is a high probability that significant archaeological resources could be impacted by the proposed project. PHMC required that a Phase 1 survey be completed. The Department requested that documentation indicating that the survey was completed, along with documentation that the potential conflicts have been resolved, be submitted. The response indicates that information has been provided to PHMC. The documentation requested by the Department has not been provided.

   Documentation that the potential conflicts with PHMC have been resolved must be submitted to the Department.

5. In their responses to Items 8, 9, 10, 12, and 20 of the Department's September 7, 2011, letter, Weston Solutions, Inc., indicated that specific pages in the Plan would be updated to reflect revised language which addressed the Department's comments. Although the response letter indicates that the pages will be updated, the Department did not receive copies of the updated pages.

   Copies of all updated pages must be submitted to the Department.

6. Item 26 of the Department's September 7, 2011, letter identified many comments provided by or on behalf of Brookhaven Borough regarding the proposed Plan. Although some of these comments may have been addressed in the ongoing correspondence between representatives of Brookhaven Borough and representatives of SWDCMA and DELCORA, a comprehensive response to Item 26 has not been provided to the Department.

   A response to Item 26 of the Department's September 7, 2011, letter is required.

Information that addresses all of the deficiencies identified above must be submitted <u>together</u>. The Department will not review information submitted individually. Please provide responses to all of the comments above by January 13, 2012. The Department's review period of 120 days does not start until a complete submission is received.

If there are any questions concerning the information required, please contact me at 484.250.5182.

Sincerely,

Kelly A. Sweeney
Sewage Planning Specialist 2
Water Management

cc: Mr. Pickett – Delaware County Planning Department (via e-mail)
Ms. Holm – Delaware County Planning Department (via e-mail)
Ms. Volkay-Hilditch – DELCORA (via e-mail)
Mr. Salvucci – DELCORA (via e-mail)
Mr. Crum – SWDCMA (via e-mail)
Mr. Catania – SDCA
Mr. Lehr – Aston Township (via e-mail)
Ms. McKinley – Brookhaven Borough (via e-mail)
Ms. Mulvena – Walton, Mulvena & Associates (via e-mail)
Mr. Pisarek – Chester Township
Ms. Timmins – Chester Heights Borough (via e-mail)
Ms. Reiner – Edgmont Township (via e-mail)
Mr. Clark – Middletown Township (via e-mail)
Mr. Majeski – Middletown Township Sewer Authority (via e-mail)
Mr. Fazler – Bradford Engineering Associates, Inc. (via e-mail)
Ms. Coleman – Upper Chichester Township (via e-mail)
Mr. Cashman – Upper Providence Township (via e-mail)
Mr. Donze – Upper Providence Township Sewer Authority
Mr. Kelly – Kelly & Close Engineers
Mr. Butler – City of Chester (via e-mail)
Adam N. Bram, Esq. – Office of Chief Counsel (via e-mail)
Mr. Feola – DEP (via e-mail)
Ms. Fields – DEP (via e-mail)
Ms. Mahoney – DEP (via e-mail)
Planning Section
Re 30 (joh11wqm)320-3

Township of Upper Chichester
County of Delaware
P.O. Box 2187
Upper Chichester, Pennsylvania 19061-8187
PHONE: 610-485-5881 FAX: 610-485-8643

October 14, 2011

James E. Stewart, President
Upper Chichester Township
PO Box 2187 Furey Road
Upper Chichester, PA 19061

RE: Act 537 Sewage Facilities Plan Update Review – Western Plan of Study, Chester-Ridley Creek Service Area

Dear Jim:

I am writing in response to your request for review comments on the plan noted above. The Upper Chichester Township Planning Commission has no comments on the plan update, and recommends its approval by the Upper Chichester Township's Board of Commissioners.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

James Renner
James Renner
Chairman
Planning Commission

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 Fax 610-701-3186
www.westonsolutions.com

14 October 2011

Ms. Kelly A. Sweeney
Municipal Planning and Finance Section
PADEP Southeast Regional Office
2 East Main Street
Norristown, PA 19401

Re: Act 537 Plan Update Western Delaware County Act 537 Plan Update for the Chester-Ridley Creek Service Area

Aston, Chester, Edgmont, Middletown, Upper Chichester, and Upper Providence Townships; Brookhaven and Chester Heights Boroughs; and City of Chester Delaware County

Dear Ms. Sweeney:

On September 8, 2011, the Southeast Regional Office of the Department of Environmental Protection (PADEP) received the resubmission of the proposed Official Sewage Facilities Plan ("Plan") entitled *Western Delaware County Act 537 Plan Update for the Chester-Ridley Creek Service Area*. On September 22, 2011, additional information was submitted to the Department. Comments requesting additional information necessary to consider the Plan administratively complete were received via e-mail from PADEP to the Delaware County Regional Water Quality Control Authority (DELCORA) on October 11, 2011. This letter and attachments are provided on behalf of DELCORA and the Delaware County Planning Department (DCPD) to provide the additional information necessary for an administratively complete Plan submission to PADEP.

Comments and Responses:

Comment 1. Item 2 of the Department's June 21, 2011, letter required the submission of a Plan Summary. The Plan Summary is described in the Administrative Completeness Checklist that is found in Part 2 of the DEP publication entitled Instructions for Completing Act 537 Plan Content and Environmental Assessment Checklist (Document ID 362-0300-003). The Plan Summary is required by the Department's regulations, under Title 25, Chapter 71, Section 71.21(a)(7).

Your response indicates that the Administrative Completeness Checklist was submitted with the Plan and included an indication of the page numbers in the Plan where items required to be in the Plan Summary were included.

Your response is not adequate. Submit a distinct Plan Summary, which includes all of the information required by Title 25, Chapter 71, Section 71.21(a)(7) and Part 2 of the Administrative Completeness Checklist.

Response: Attached is the Plan Summary as requested.

Comment 2. Item 3 of the Department's June 21, 2011, letter requested that you clarify why Chester Heights Borough was not included in Section C of the Act 537 Plan Content and Environmental Assessment Checklist. This section provides the names of the municipalities which are tributary to the existing SWDCMA Wastewater Treatment Facility and are, therefore, municipalities affected by this Plan.

Your response indicates that Chester Heights Borough has been added to Section C. In addition, your resubmission indicates that Brookhaven Borough has been included in this submission. As such, Brookhaven Borough must be included in Section C.

Revise Section C of the Act 537 Plan Content and Environmental Assessment Checklist, so that it is consistent with the proposed Plan.

Response: Attached is the revised Act 537 Plan Content and Environmental Assessment Checklist as requested.

Comment 3. Item 4 of the Department's June 21, 2011, letter required the submission of an original, signed, and sealed Resolution of Adoption from Aston Township, Chester Heights Borough, Chester Township, the City of Chester, Middletown Township, Upper Chichester Township, and Upper Providence Township. The Resolutions are required to reference the specific alternatives chosen and correctly identify the title of the Plan.

Further, this item required the submission of an original, signed, and sealed Resolution of Adoption from Edgmont Township, which referenced the specific alternatives chosen, correctly identified the title of the Plan, and did not contain any conditions to the approval.

Revised Resolutions were received from Aston Township, Chester Township, Chester Heights Borough, the City of Chester, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; however, the revised Resolutions continue to incorrectly identify the title of the Plan. A "Plan of Study" is a separate document used to initiate planning and lists possible costs for future reimbursement. As such, you were informed that the Plan may not be referred to as the "Western Plan of Study."

Resolutions that contain all of the required information, and which reference the proper title of the Plan ("Western Delaware County Act 537 Sewage Facilities Plan Update for the Chester-Ridley Creek Service Area") must be submitted for Aston Township, Chester Heights Borough, Chester Township, the City of Chester, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township.

Response: The plan that was submitted for the Chester-Ridley Creek Service Area is an update of the existing Delaware County Act 537 Sewage Facilities Plan Revision: Western Plan of Study that was approved by PADEP on October 2, 2006 (APS Id. 480595 AUTH Id. 647542). Accordingly, the resolutions as approved by the municipalities are titled correctly. The cover of this plan has been modified to reflect the update relationship of this Plan to the previously approved Plan. A copy of the revised Plan cover is attached to this letter.

Comment 4. Item 5 of the Department's June 21, 2011, letter required that you submit comments from the planning agencies of Aston Township, Chester Heights Borough, Chester Township, the City of Chester, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township, along with evidence that all comments received from the municipal planning agencies were considered by the host municipalities. Alternately, you were advised that you may submit documentation that the Plan was before any of the planning agencies for 60 days without comment, which would satisfy the requirement to obtain comments from that planning agency.

Your resubmission indicates that the Plan was submitted to all municipalities in the Study Area with a request for municipal review. The Resolutions have been revised to include a note that the municipalities' planning agencies have reviewed the Plan. Further, the resubmission indicates that the Plan was provided to the municipalities on February 2, 2011, with the request for review and comment, and more than 60 days has elapsed since the Plan was delivered to the municipalities.

Separate documentation of the municipal planning agencies' reviews is required. Title 25, Chapter 71, Section 71.31(b) clearly requires that a municipality request, review and consider comments by appropriate official planning agencies of the municipality. Comments of the planning agencies of all of the above-referenced municipalities must be submitted. In addition, documentation that all of the comments received from the municipal planning agencies were considered must be submitted to the Department.

Alternately, you may submit documentation, in the form of a signed certified mail receipt, which documents the day on which the Plan was delivered to the municipal planning agencies, as evidence that the Plan was before these agencies for 60 days without comment.

Response: Attached are letters from the municipal planning agencies indicating that they reviewed the document and have no comments. Upper Chichester Township has indicated that a letter confirming no comments from their planning commission is forthcoming. WESTON will forward the letter to PADEP upon receipt.

Comment 5. Item 6 of the Department's June 21, 2011, letter required that a new public notice, which included all of the information required by Chapter 71, Section 71.31(c), be published and that an additional 30-day public comment period be provided.

The resubmission includes a letter from DELCORA, which states that no comments were received as a result of the public notice. Please note that consideration of and response to public comments

is a municipal responsibility. Submit letters from each of the affected municipalities indicating that no comments were received. If any municipality received comments, copies of the comments and the municipality's response to the comment must be provided.

Response: The municipalities authorized DCPD and DELCORA to prepare the plan update on their behalf by resolution. DELCORA advertised the plan and solicited comments from the public and from the municipalities. All of the municipalities (with the exception of Brookhaven Borough) have passed a resolution adopting the Delaware County Act 537 Sewage Facilities Plan Update - Western Plan of Study: Chester-Ridley Creek Service Area as an amendment to their official plan for sewage facilities. Any comments from municipal residents or planning agencies would have been resolved prior to adoption of the plan update. Municipal comments are documented and addressed in Appendix E of the Plan Update and letters from the municipal planning commissions are attached to this letter.

Comment 6. Item 9 of the Department's June 21, 2011, letter indicated that the Plan did not appear to contain any documentation that SWDCMA agreed to the proposed decommissioning of their wastewater treatment facility and the diversion of the flow to the DELCORA wastewater treatment facility.

Your response indicates that SWDCMA has prepared a letter clearly indicating their intention to decommission the treatment plant upon successful start-up of the pump station and force main and states that the letter is included as Attachment I.

The letter is not included in the resubmission. Submit a copy of the SWDCMA letter.

Response: The statement referencing a letter from SWDCMA indicating their intention to decommission the treatment plant should have been removed from the September 7, 2011, response to PADEP comments. The agreement between DELCORA and SWDCMA that was submitted on September 7, 2011, clearly states in paragraph 4 on page 1 that SWDCMA will "cease to treat wastewater" and will divert flows from its service area to DELCORA for treatment. Additionally, the response to technical comments submitted on October 10, 2011, includes SWDCMA's budget projection through 2040. This includes a $3,000,000 capital cost charge for the decommissioning of the Baldwin Run Pollution Control Plant. A letter containing an explicit statement of intent to decommission the BRPCP has been requested from the SWDCMA.

Comment 7. Item 10 of the Department's June 21, 2011, letter required the submission of a final, signed agreement between DELCORA and the Southern Delaware County Authority ("SDCA") that notes that flows generated in Upper Chichester Township that are served by the collection and conveyance system owned and operated by SDCA will be diverted to DELCORA.

Your response indicates that the SDCA entered into an agreement with DELCORA for the treatment of some of the wastewater generated by its member municipalities. It appears that this agreement covers the flows that are tributary to the Naaman's Creek pump station and subsequently to the DELCORA treatment plant. It does not appear to cover the sewage that will be conveyed by

the new pump station and force main on the site of the SWDCMA treatment plant to the DELCORA treatment plant.

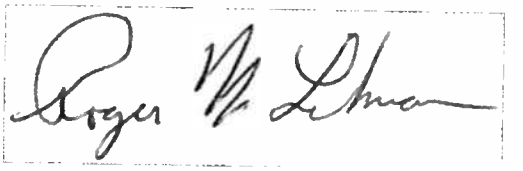
An agreement, as described in the Department's June 21, 2011, letter must be submitted.

Response: DELCORA does not have an agreement with SDCA for treatment of the flow coming to the BRPCP from Upper Chichester Township. The SDCA has an agreement with the SWDCMA for treatment of flow from portions of Upper Chichester Township. DELCORA has an agreement with the SWDCMA to treat all flow coming from the Chester-Ridley Creek Service Area through the proposed pump station and force main. This would include flow from SDCA.

Please don't hesitate to call me at 610-701-3708 or Beth Bolt at 610-701-3132 if the responses provided in this letter do not satisfy the requirements for an administratively complete Plan submission to PADEP, or if you have any questions regarding these responses.

Very truly yours,

WESTON SOLUTIONS, INC.



Roger W. Lehman, P.E.
Senior Technical Manager

Cc: E. Mahoney, PADEP, via e-mail
K. Dudley, PADEP, via e-mail
J. Fields, PADEP, via e-mail
C. Volkay-Hilditch, DELCORA, via e-mail
R. Powell, DELCORA, via e-mail
K. Holm, DCPD, via e-mail

PLAN SUMMARY

This plan is an update of the existing Delaware County Act 537 Sewage Facilities Plan Revision: Western Plan of Study that was approved by PADEP on October 2, 2006 (APS Id. 480595 AUTH Id. 647542). This plan is for the area currently served by the Baldwin Run Pollution Control Plant (BRPCP) which is owned and operated by Southwest Delaware County Municipal Authority (SWDCMA) and is referred to in this planning document as the Chester-Ridley Creek Service Area. The planning area encompasses 21.72 square miles in eight municipalities in Delaware County. The Chester-Ridley Creek Service Area includes Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Middletown Township, Upper Chichester Township, Upper Providence Township, and 27 approved planned residences in Edgmont Township. SWDCMA owns and operates the collection systems in Aston, Brookhaven, Chester Heights and Chester Township as well as interceptors that transport flow from other municipalities to the BRPCP.

The BRPCP, located in Aston, PA is currently permitted to treat 6 MGD of sewage. The 2009 Chapter 94 report indicated that the facility treated a 5-year maximum three month consecutive average (MTMCA) of 5.32 MGD. The MTMCA projected for 2014 is 5.6 MGD, or 93% of permitted capacity. The plant discharges to Chester Creek which has been under scrutiny in recent years for not meeting designated uses. SWDCMA entered into a Consent Order and Agreement (dated 5 February 2009) with PADEP to remediate Inflow and Infiltration (I/I) contributing to sanitary sewer overflows in the collection system and at pump stations. In addition, upgrades to the BRPCP are required for continued operation of that facility, especially upon the anticipated implementation of lower effluent limits for nutrients in 2014. This plan examines options to address the lack of future capacity as well as the need to meet increasingly tighter discharge requirements. This plan includes a conceptual design and construction schedule for the recommended facilities that are necessary to meet the needs of the service area.

The evaluation of available alternatives presented in the plan led to the recommendation of constructing a new pump station and force main to send all flow from the Chester-Ridley Creek Service Area to the Western Regional Treatment Plant (WRTP) in Chester which is owned and operated by the Delaware County Regional Water Quality Control Authority (DELCORA). Existing reserve capacity in DELCORA's Western Regional Treatment Plant (WRTP) will

accommodate flows from the SWDCMA. No proposed construction or plant expansion of the WRTP is proposed under this Act 537 Plan Chester-Ridley Creek Service Area Update.

Additionally, the plan recommends that SWDCMA continue to repair and address I/I issues as required by the consent decree. DELCORA and SWDCMA and entered into an agreement to implement the recommended alternative and a copy of the agreement is provided in an attachment to the response to comments submitted on September 7, 2011.

The initial cost estimate for design and construction of the selected treatment alternative is $11,768,618. Financed over a 20-year period, this cost equated to approximately $53 per year per EDU. Decommissioning the existing BRPCP will cost approximately $32 per year per EDU. Additional operational costs from SWDCMA to maintain the collection system, comply with the Consent Agreement, and pay existing debts were provided by SWDCMA and are attached to this Chester-Ridley Creek Service Area Plan Update as Appendix G. The preferred funding method will be bond financing. The contingency financing plan is to use existing DELCORA capital reserves.

SWDCMA is committed to decommissioning the BRPCP and to continuing the I/I abatement program required in the consent decree. DELCORA is committed to construct, own, and operate the pump station and force main as well as to continue to operate the WRTP as an environmentally safe facility. Implementation of the recommended alternative contained in this Plan Update is planned to be complete by August 1, 2014. Intermediate benchmark dates are noted in the table below:

Implementation Schedule for Pump Station and Force Main Alternative 2C, Baldwin Run to Union Street Alignment

Date	Milestone
September 6, 2011	Submit amended Final Plan to PADEP with Brookhaven added to the study area.
October 30, 2011	PADEP Act 537 Plan approval.
October 30, 2011	Begin final engineering design for pump station and force main
March 1, 2012	Complete 60% design and submit E&S and NPDES Construction Activity Permit applications to PADEP
March 1, 2012	Submit Water Quality Management Permit Application
June 1, 2012	Advertise for bids
August 1, 2012	Bid selection and construction contract award
August 1, 2014	Complete construction and divert flow to WRTP

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Act 537 Plan Content and Environmental Assessment Checklist

PART 1 GENERAL INFORMATION

A. Project Information

1. Project Name Western Delaware County Act 537 Sewage Facilities Plan Update Chester-Ridley Creek Service Areat

2. Brief Project Description Act 537 Plan update including all municipalities within the Southwest Delaware County Municipal Authority (SWDCMA) service area to resolve existing problems at the Baldwin Run Pollution Control Plant (BRPCP) discharging to Chester Creek in Aston, Twp., Delaware County.

B. Client (Municipality) Information

Municipality Name	County	City	Boro	Twp
Delaware County Regional Water Quality Control Authority (DELCORA)	Delaware	☐	☐	☐

Municipality Contact Individual - Last Name	First Name	MI	Suffix	Title
Volkay-Hilditch	Christine		PE,DEE	Director of Engineering

Additional Individual Last Name	First Name	MI	Suffix	Title
Powell	Robert	A		Business Development Manager

Municipality Mailing Address Line 1	Mailing Address Line 2
100 East Fifth Street	P.O. Box 999

Address Last Line -- City	State	ZIP+4
Chester	PA	19016-0999

Phone + Ext.	FAX (optional)	Email (optional)
610-876-5523 X 116	610-827-2728	hilditchc@delcora.org

C. Site Information

Site (or Project) Name	(Municipal Name) Act 537 Plan
Delaware County Western Region	

Site Location Line 1	Site Location Line 2
Aston Twp., Chester Twp, Chester Heights Borough, Brookhaven Borough, and Chester City	Middletown, Edgmont, Upper Chichester, Upper Providence Twps.

D. Project Consultant Information

Last Name	First Name	MI	Suffix
Lehman	Roger	W	P.E.

Title	Consulting Firm Name
Technical Director	Weston Solutions, Inc.

Mailing Address Line 1	Mailing Address Line 2
Building 5-1	1400 Weston Way

Address Last Line – City	State	ZIP+4	Country
West Chester	PA	19380	USA

Email	Phone + Ext.	FAX
Roger.Lehman @ Westonsolutions.com	610 701 3708	610 701 3401

PART 2 ADMINISTRATIVE COMPLETENESS CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan	In addition to the main body of the plan, the plan must include items one through eight listed below to be accepted for formal review by the department. Incomplete Plans will be returned unless the municipality is clearly requesting an advisory review.
____	i	1. **Table of Contents**
		2. **Plan Summary**
_____	PS-1	A. Identify the proposed service areas and major problems evaluated in the plan. (Reference - Title 25, §71.21.a.7.i).
_____	PS-1	B. Identify the alternative(s) chosen to solve the problems and serve the areas of need identified in the plan. Also, include any institutional arrangements necessary to implement the chosen alternative(s). (Reference Title 25 §71.21.a.7.ii).
_____	PS-2	C. Present the estimated cost of implementing the proposed alternative (including the user fees) and the proposed funding method to be used. (Reference Title 25, §71.21.a.7.ii).
_____	PS-2	D. Identify the municipal commitments necessary to implement the Plan. (Reference Title 25, §71.21.a.7.iii).
_____	PS-2	E. Provide a schedule of implementation for the project that identifies the MAJOR milestones with dates necessary to accomplish the project to the point of operational status. (Reference Title 25, §71.21.a.7.iv).
_____	Appendix D	3. **Municipal Adoption: Original,** signed and sealed Resolution of Adoption by the municipality which contains, at a minimum, alternatives chosen and a commitment to implement the Plan in accordance with the implementation schedule. (Reference Title 25, §71.31.f) Section V.F. of the Planning Guide.
_____	Appendix E	4. **Planning Commission / County Health Department Comments**: Evidence that the municipality has requested, reviewed and considered comments by appropriate official planning agencies of the municipality, planning agencies of the county, planning agencies with area wide jurisdiction (where applicable), and any existing county or joint county departments of health. (Reference-Title 25, §71.31.b) Section V.E.1 of the Planning Guide.
_____	Appendix F	5. **Publication:** Proof of Public Notice which documents the proposed plan adoption, plan summary, and the establishment and conduct of a 30 day comment period. (Reference-Title 25, §71.31.c) Section V.E.2 of the Planning Guide.
_____	Appendix E	6. **Comments and Responses:** Copies of ALL written comments received and municipal response to EACH comment in relation to the proposed plan. (Reference-Title 25, §71.31.c) Section V.E.2 of the Planning Guide.
_____	9-1	7. **Implementation Schedule:** A complete project implementation schedule with milestone dates specific for each existing and future area of need. Other activities in the project implementation schedule should be indicated as occurring a finite number of days from a major milestone. (Reference-Title 25, §71.31.d) Section V.F. of the Planning Guide. Include dates for the future initiation of feasibility evaluations in the project's implementation schedule for areas proposing completion of sewage facilities for planning periods in excess of five years. (Reference Title 25, §71.21.c).
_____	Appendix E	8. **Consistency Documentation:** Documentation indicating that the appropriate agencies have received, reviewed and concurred with the method proposed to resolve identified inconsistencies within the proposed alternative and consistency requirements in 71.21.(a)(5)(i-iii). (Reference-Title 25, §71.31.e). Appendix B of the Planning Guide.

PART 3 GENERAL PLAN CONTENT CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan		Item Required
_____	5-1	**I.**	**Previous Wastewater Planning**
		A.	Identify, describe and briefly analyze all past wastewater planning for its impact on the current planning effort:
_____	5-1	1.	Previously undertaken under the Sewage Facilities Act (Act 537). (Reference-Act 537, Section 5 §d.1).
_____	_____	2.	Has not been carried out according to an approved implementation schedule contained in the plans. (Reference-Title 25, §71.21.a.5.i.A-D). Section V.F of the Planning Guide.
_____	_____	3.	Is anticipated or planned by applicable sewer authorities or approved under a Chapter 94 Corrective Action Plan. (Reference-Title 25, §71.21.a.5.i.A&B). Section V.D. of the Planning Guide.
_____	_____	4.	Through planning modules for new land development, planning "exemptions" and addenda. (Reference-Title 25, §71.21.a.5.i.A).
_____	p. 1-2 through 1-5	**II.**	**Physical and Demographic Analysis utilizing written description and mapping** (All items listed below require maps, and all maps should show all current lots and structures and be of appropriate scale to clearly show significant information).
_____	p. 1-5	A.	Identification of planning area(s), municipal boundaries, Sewer Authority/Management Agency service area boundaries. (Reference-Title 25, §71.21.a.1.i).
_____	N/A	B.	Identification of physical characteristics (streams, lakes, impoundments, natural conveyance, channels, drainage basins in the planning area). (Reference-Title 25, §71.21.a.1.ii).
_____	N/A	C.	Soils - Analysis with description by soil type and soils mapping for areas not presently served by sanitary sewer service. Show areas suitable for in-ground onlot systems, elevated sand mounds, individual residential spray irrigation systems, and areas unsuitable for soil dependent systems. (Reference-Title 25, §71.21.a.1.iii). Show Prime Agricultural Soils and any locally protected agricultural soils. (Reference-Title 25, §71.21.a.1.iii).
_____	N/A	D.	Geologic Features - (1) Identification through analysis, (2) mapping and (3) their relation to existing or potential nitrate-nitrogen pollution and drinking water sources. Include areas where existing nitrate-nitrogen levels are in excess of 5 mg/L. (Reference-Title 25, §71.21.a.1.iii).
_____	N/A	E.	Topography - Depict areas with slopes that are suitable for conventional systems; slopes that are suitable for elevated sand mounds and slopes that are unsuitable for onlot systems. (Reference-Title 25, §71.21.a.1.ii).
_____	N/A	F.	Potable Water Supplies - Identification through mapping, description and analysis. Include public water supply service areas and available public water supply capacity and aquifer yield for groundwater supplies. (Reference-Title 25 §71.21.a.1.vi). Section V.C. of the Planning Guide.

_____ N/A G. Wetlands-Identify wetlands as defined in Title 25, Chapter 105 by description, analysis and mapping. Include National Wetland Inventory mapping and potential wetland areas per USDA, SCS mapped hydric soils. Proposed collection, conveyance and treatment facilities and lines must be located and labeled, along with the identified wetlands, on the map. (Reference-Title 25, §71.21.a.1.v). Appendix B, Section II.I of the Planning Guide.

_____ 1-12 **III. Existing Sewage Facilities in the Planning Area - Identifying the Existing Needs**

A. Identify, map and describe municipal and non-municipal, individual and community sewerage systems in the planning area including:

_____ 3-5 1. Location, size and ownership of treatment facilities, main intercepting lines, pumping stations and force mains including their size, capacity, point of discharge. Also include the name of the receiving stream, drainage basin, and the facility's effluent discharge requirements. (Reference-Title 25, §71.21a.2.i.A).

_____ 3-5 & 3-6 2. A narrative and schematic diagram of the facility's basic treatment processes including the facility's NPDES permitted capacity, and the Clean Streams Law permit number. (Reference-Title 25, §71.21.a.2.i.A).

_____ 3-6 3. A description of problems with existing facilities (collection, conveyance and/or treatment), including existing or projected overload under Title 25, Chapter 94 (relating to municipal wasteload management) or violations of the NPDES permit, Clean Streams Law permit, or other permit, rule or regulation of DEP. (Reference-Title 25, §71.21.a.2.i.B).

_____ 3-6 4. Details of scheduled or in-progress upgrading or expansion of treatment facilities and the anticipated completion date of the improvements. Discuss any remaining reserve capacity and the policy concerning the allocation of reserve capacity. Also discuss the compatibility of the rate of growth to existing and proposed wastewater treatment facilities. (Reference-Title 25, §71.21.a.4.i & ii).

_____ 7-4 5. A detailed description of the municipality's operation and maintenance requirements for small flow treatment facility systems, including the status of past and present compliance with these requirements and any other requirements relating to sewage management programs. (Reference-Title 25, §71.21.a.2.i.C).

_____ N/A 6. Disposal areas, if other than stream discharge, and any applicable groundwater limitations. (Reference-Title 25, §71.21.a.4.i & ii).

_____ 4-2 B. Using DEP's publication titled *Sewage Disposal Needs Identification*, identify, map and describe areas that utilize individual and community onlot sewage disposal and, unpermitted collection and disposal systems ("wildcat" sewers, borehole disposal, etc.) and retaining tank systems in the planning area including:

_____ 4-3 to 4-4 1. The types of onlot systems in use. (Reference-Title 25, §71.21.a.2.ii.A).

_____ N/A 2. A sanitary survey complete with description, map and tabulation of documented and potential public health, pollution, and operational problems (including malfunctioning systems) with the systems, including violations of local ordinances, the Sewage Facilities Act, the Clean Stream Law or regulations promulgated thereunder. (Reference-Title 25, §71.21.a.2.ii.B).

_____ N/A 3. A comparison of the types of onlot sewage systems installed in an area with the types of systems which are appropriate for the area according to soil, geologic conditions, topographic limitations sewage flows, and Title 25 Chapter 73 (relating to standards for sewage disposal facilities). (Reference-Title 25, §71.21.a.2.ii.C).

_____	N/A	4. An individual water supply survey to identify possible contamination by malfunctioning onlot sewage disposal systems consistent with DEP's *Sewage Disposal Needs Identification* publication. (Reference-Title 25 §71.21.a.2.ii.B).
_____	N/A	5. Detailed description of operation and maintenance requirements of the municipality for individual and small volume community onlot systems, including the status of past and present compliance with these requirements and any other requirements relating to sewage management programs. (Reference-Title 25, §71.21.a.2.i.C).
_____	_____	C. Identify wastewater sludge and septage generation, transport and disposal methods. Include this information in the sewage facilities alternative analysis including:
_____	3-1	1. Location of sources of wastewater sludge or septage (Septic tanks, holding tanks, wastewater treatment facilities). (Reference-Title 25 §71.71).
_____	3-1	2. Quantities of the types of sludges or septage generated. (Reference-Title 25 §71.71).
_____	3-5	3. Present disposal methods, locations, capacities and transportation methods. (Reference-Title 25 §71.71).
_____	5-13	**IV. Future Growth and Land Development**
		A. Identify and briefly summarize all municipal and county planning documents adopted pursuant to the Pennsylvania Municipalities Planning Code (Act 247) including:
_____	N/A	1. All land use plans and zoning maps that identify residential, commercial, industrial, agricultural, recreational and open space areas. (Reference-Title 25, §71.21.a.3.iv).
_____	5-13	2. Zoning or subdivision regulations that establish lot sizes predicated on sewage disposal methods. (Reference – Title 25§71.21.a.3.iv).
_____	N/A	3. All limitations and plans related to floodplain and stormwater management and special protection (Ch. 93) areas. (Reference-Title 25 §71.21.a.3.iv) Appendix B, Section II.F of the Planning Guide.
		B. Delineate and describe the following through map, text and analysis.
_____	5-7 through 5-10	1. Areas with existing development or plotted subdivisions. Include the name, location, description, total number of EDU's in development, total number of EDU's currently developed and total number of EDU's remaining to be developed (include time schedule for EDU's remaining to be developed). (Reference-Title 25, §71.21.a.3.i).
_____	N/A	2. Land use designations established under the Pennsylvania Municipalities Planning Code (35 P.S. 10101-11202), including residential, commercial and industrial areas. (Reference-Title 25,§71.21.a.3.ii). Include a comparison of proposed land use as allowed by zoning and existing sewage facility planning. (Reference-Title 25, §71.21.a.3.iv).
_____	5-23	3. Future growth areas with population and EDU projections for these areas using historical, current and future population figures and projections of the municipality. Discuss and evaluate discrepancies between local, county, state and federal projections as they relate to sewage facilities. (Reference-Title 25, §71.21.a.1.iv). (Reference-Title 25, §71.21.a.3.iii).

_____	N/A	4. Zoning, and/or subdivision regulations; local, county or regional comprehensive plans; and existing plans of any other agency relating to the development, use and protection of land and water resources with special attention to: (Reference-Title 25, §71.21.a.3.iv). --public ground/surface water supplies --recreational water use areas --groundwater recharge areas --industrial water use --wetlands
_____	5-5 through 5-23	5. Sewage planning necessary to provide adequate wastewater treatment for five and ten year future planning periods based on projected growth of existing and proposed wastewater collection and treatment facilities. (Reference-Title 25, §71.21.a.3.v).
_____	6-1	**V. Identify Alternatives to Provide New or Improved Wastewater Disposal Facilities**
		A. Conventional collection, conveyance, treatment and discharge alternatives including:
_____	6-1	1. The potential for regional wastewater treatment. (Reference-Title 25, §71.21.a.4).
_____	6-2	2. The potential for extension of existing municipal or non-municipal sewage facilities to areas in need of new or improved sewage facilities. (Reference-Title 25, §71.21.a.4.i).
_____	6 1	3. The potential for the continued use of existing municipal or non-municipal sewage facilities through one or more of the following: (Reference-Title 25, §71.21.a.4.ii).
_____	6-1	a. Repair. (Reference-Title 25, §71.21.a.4.ii.A).
_____	6-1	b. Upgrading. (Reference-Title 25, §71.21.a.4.ii.B).
_____	6-1	c. Reduction of hydraulic or organic loading to existing facilities. (Reference-Title 25, §71.71).
_____	6-2	d. Improved operation and maintenance. Reference-Title 25, §71.21.a.4.ii.C).
_____	8-1	e. Other applicable actions that will resolve or abate the identified problems. (Reference-Title 25, §71.21.a.4.ii.D).
_____	8-1	4. Repair or replacement of existing collection and conveyance system components. (Reference-Title 25, §71.21.a.4.ii.A).
_____	8-2	5. The need for construction of new community sewage systems including sewer systems and/or treatment facilities. (Reference-Title 25, §71.21.a.4.iii).
_____	N/A	6. Use of innovative/alternative methods of collection/conveyance to serve needs areas using existing wastewater treatment facilities. (Reference-Title 25, §71.21.a.4.ii.B).
_____	N/A	B. The use of individual sewage disposal systems including individual residential spray irrigation systems based on:
_____	_____	1. Soil and slope suitability. (Reference-Title 25, §71.21.a.2.ii.C).
_____	_____	2. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.21.a.2.ii.C).
_____	_____	3. The establishment of a sewage management program. (Reference-Title 25, §71.21.a.4.iv). See also Part "F" below.
_____	_____	4. The repair, replacement or upgrading of existing malfunctioning systems in

areas suitable for onlot disposal considering: (Reference-Title 25, §71.21.a.4).

_____ _____ a. Existing technology and sizing requirements of Title 25 Chapter 73. (Reference-Title 25, §73.31-73.72).

_____ _____ b. Use of expanded absorption areas or alternating absorption areas. (Reference-Title 25, §73.16).

_____ _____ c. Use of water conservation devices. (Reference-Title 25, §71.73.b.2.iii).

_____ N/A C. The use of small flow sewage treatment facilities or package treatment facilities to serve individual homes or clusters of homes with consideration of: (Reference-Title 25, §71.64.d).

_____ _____ 1. Treatment and discharge requirements. (Reference-Title 25, §71.64.d).

_____ _____ 2. Soil suitability. (Reference-Title 25, §71.64.c.I).

_____ _____ 3. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.64.c.2).

_____ _____ 4. Municipal, Local, Agency or other controls over operation and maintenance requirements through a Sewage Management Program. (Reference-Title 25, §71.64.d). See Part "F" below.

_____ N/A D. The use of community land disposal alternatives including:

_____ _____ 1. Soil and site suitability. (Reference-Title 25, §71.21.a.2.ii.C).

_____ _____ 2. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.21.a.2.ii.C).

_____ _____ 3. Municipality, Local Agency or Other Controls over operation and maintenance requirements through a Sewage Management Program (Reference-Title25, §71.21.a.2.ii.C). See Part "F" below.

_____ _____ 4. The rehabilitation or replacement of existing malfunctioning community land disposal systems. (See Part "V", B, 4, a, b, c above). See also Part "F" below.

_____ N/A E. The use of retaining tank alternatives on a temporary or permanent basis including: (Reference- Title 25, §71.21.a.4).

_____ _____ 1. Commercial, residential and industrial use. (Reference-Title 25, §71.63.e).

_____ _____ 2 Designated conveyance facilities (pumper trucks). (Reference-Title 25, §71.63.b.2).

_____ _____ 3. Designated treatment facilities or disposal site. (Reference-Title 25, §71.63.b.2).

_____ _____ 4. Implementation of a retaining tank ordinance by the municipality. (Reference-Title 25, §71.63.c.3). See Part "F" below.

_____ _____ 5. Financial guarantees when retaining tanks are used as an interim sewage disposal measure. (Reference-Title 25, §71.63.c.2).

_____ 8-3 F. Sewage Management Programs to assure the future operation and maintenance of existing and proposed sewage facilities through:

_____ N/A 1. Municipal ownership or control over the operation and maintenance of individual onlot sewage disposal systems, small flow treatment facilities, or other traditionally non-municipal treatment facilities. (Reference-Title 25, §71.21.a.4.iv).

_____ 8-3 2. Required inspection of sewage disposal systems on a schedule established by the municipality. (Reference-Title 25, §71.73.b.1.).

_____ N/A 3. Required maintenance of sewage disposal systems including septic and aerobic treatment tanks and other system components on a schedule

established by the municipality. (Reference-Title 25, §71.73.b.2).

_____ 4-3 to 4-5 4. Repair, replacement or upgrading of malfunctioning onlot sewage systems. (Reference-Title 25, §71.21.a.4.iv) and §71.73.b.5 through:

_____ N/A a. Aggressive pro-active enforcement of ordinances that require operation and maintenance and prohibit malfunctioning systems. (Reference-Title 25, §71.73.b.5).

_____ App C. b. Public education programs to encourage proper operation and maintenance and repair of sewage disposal systems.

_____ N/A 5. Establishment of joint municipal sewage management programs. (Reference-Title 25, §71.73.b.8).

_____ N/A 6. Requirements for bonding, escrow accounts, management agencies or associations to assure operation and maintenance for non-municipal facilities. (Reference-Title 25, §71.71).

_____ 8-2 G. Non-structural comprehensive planning alternatives that can be undertaken to assist in meeting existing and future sewage disposal needs including: (Reference-Title 25, §71.21.a.4).

1. Modification of existing comprehensive plans involving:

_____ N/A a. Land use designations. (Reference-Title 25, §71.21.a.4).

_____ N/A b. Densities. (Reference-Title 25, §71.21.a.4).

_____ N/A c. Municipal ordinances and regulations. (Reference-Title 25, §71.21.a.4).

_____ N/A d. Improved enforcement. (Reference-Title 25, §71.21.a.4).

_____ N/A e. Protection of drinking water sources. (Reference-Title 25, §71.21.a.4).

_____ N/A 2. Consideration of a local comprehensive plan to assist in producing sound economic and consistent land development. (Reference-Title 25, §71.21.a.4).

_____ N/A 3. Alternatives for creating or changing municipal subdivision regulations to assure long-term use of on-site sewage disposal that consider lot sizes and protection of replacement areas. (Reference-Title 25, §71.21.a.4).

_____ N/A 4. Evaluation of existing local agency programs and the need for technical or administrative training. (Reference-Title 25, §71.21.a.4).

_____ N/A H. A no-action alternative which includes discussion of both short-term and long-term impacts on: (Reference-Title 25, §71.21.a.4).

_____ _____ 1. Water Quality/Public Health. (Reference-Title 25, §71.21.a.4).

_____ _____ 2. Growth potential (residential, commercial, industrial). (Reference-Title 25, §71.21.a.4).

_____ _____ 3. Community economic conditions. (Reference-Title 25, §71.21.a.4).

_____ _____ 4. Recreational opportunities. (Reference-Title 25, §71.21.a.4).

_____ _____ 5. Drinking water sources. (Reference-Title 25, §71.21.a.4).

_____ _____ 6. Other environmental concerns. (Reference-Title 25, §71.21.a.4).

_____ 6-1 **VI. Evaluation of Alternatives**

A. Technically feasible alternatives identified in Section V of this check-list must be evaluated for consistency with respect to the following: (Reference-Title 25, §71.21.a.5.i.).

_____ 6-15 1. Applicable plans developed and approved under **Sections 4 and 5 of the Clean Streams Law or Section 208 of the Clean Water Act** (33 U.S.C.A. 1288). (Reference-Title 25, §71.21.a.5.i.A). Appendix B, Section II.A of the

Planning Guide.

_____ 6-15 2. Municipal wasteload management **Corrective Action Plans or Annual Reports** developed under PA Code, Title 25, Chapter 94. (Reference-Title 25, §71.21.a.5.i.B). The municipality's recent Wasteload Management (Chapter 94) Reports should be examined to determine if the proposed alternative is consistent with the recommendations and findings of the report. Appendix B, Section II.B of the Planning Guide.

_____ 6-16 3. Plans developed under **Title II of the Clean Water Act** (33 U.S.C.A. 1281-1299) or **Titles II and VI of the Water Quality Act of 1987** (33 U.S.C.A 1251-1376). (Reference-Title 25, §71.21.a.5.i.C). Appendix B, Section II.E of the Planning Guide.

_____ 6-16 4. **Comprehensive plans** developed under the Pennsylvania Municipalities Planning Code. (Reference-Title 25, §71.21.a.5.i.D). The municipality's comprehensive plan must be examined to assure that the proposed wastewater disposal alternative is consistent with land use and all other requirements stated in the comprehensive plan. Appendix B, Section II.D of the Planning Guide.

_____ N/A 5. **Antidegradation requirements** as contained in PA Code, Title 25, Chapters 93, 95 and 102 (relating to water quality standards, wastewater treatment requirements and erosion control) and the Clean Water Act. (Reference-Title 25, §71.21.a.5.i.E). Appendix B, Section II.F of the Planning Guide.

_____ 6-17 6. **State Water Plans** developed under the Water Resources Planning Act (42 U.S.C.A. 1962-1962 d-18). (Reference-Title 25, §71.21.a.5.i.F). Appendix B, Section II.C of the Planning Guide.

_____ 6-17 7. **Pennsylvania Prime Agricultural Land Policy** contained in Title 4 of the Pennsylvania Code, Chapter 7, Subchapter W. Provide narrative on local municipal policy and an overlay map on prime agricultural soils. (Reference-Title 25, §71.21.a.5.i.G). Appendix B, Section II.G of the Planning Guide.

_____ 6-17 8. **County Stormwater Management Plans** approved by DEP under the Storm Water Management Act (32 P.S. 680.1-680.17). (Reference-Title 25, §71.21.a.5.i.H). Conflicts created by the implementation of the proposed wastewater alternative and the existing recommendations for the management of stormwater in the county Stormwater Management Plan must be evaluated and mitigated. If no plan exists, no conflict exists. Appendix B, Section II.H of the Planning Guide.

_____ App A 9. **Wetland Protection.** Using wetland mapping developed under Checklist Section II.G, identify and discuss mitigative measures including the need to obtain permits for any encroachments on wetlands from the construction or operation of any proposed wastewater facilities. (Reference-Title 25, §71.21.a.5.i.I) Appendix B, Section II.I of the Planning Guide.

_____ App. A 10. **Protection of rare, endangered or threatened plant and animal species** as identified by the Pennsylvania Natural Diversity Inventory (PNDI). (Reference-Title 25, §71.21.a.5.i.J). Provide DEP with a copy of the completed Request For PNDI Search document. Also provide a copy of the response letter from the Department of Conservation and Natural Resources' Bureau of Forestry regarding the findings of the PNDI search. Appendix B, Section II.J of the Planning Guide.

_____ App A 11. **Historical and archaeological resource protection** under P.C.S. Title 37, Section 507 relating to cooperation by public officials with the Pennsylvania Historical and Museum Commission. (Reference-Title 25, §71.21.a.5.i.K). Provide the department with a completed copy of a Cultural Resource Notice

request of the Bureau of Historic Preservation (BHP) to provide a listing of known historical sites and potential impacts on known archaeological and historical sites. Also provide a copy of the response letter from the BHP. Appendix B, Section II.K of the Planning Guide.

_____ N/A B. Provide for the resolution of any inconsistencies in any of the points identified in Section VI.A. of this checklist by submitting a letter from the appropriate agency stating that the agency has received, reviewed and concurred with the resolution of identified inconsistencies. (Reference-Title 25, §71.21.a.5.ii). Appendix B of the Planning Guide.

_____ 6-5 through 6-14 C. Evaluate alternatives identified in Section V of this checklist with respect to applicable water quality standards, effluent limitations or other technical, legislative or legal requirements. (Reference-Title 25, §71.21.a.5.iii).

_____ 6-5 through 6-14 D. Provide cost estimates using present worth analysis for construction, financing, on going administration, operation and maintenance and user fees for alternatives identified in Section V of this checklist. Estimates shall be limited to areas identified in the plan as needing improved sewage facilities within five years from the date of plan submission. (Reference-Title 25, §71.21.a.5.iv).

_____ 3-2 E. Provide an analysis of the funding methods available to finance the proposed alternatives evaluated in Section V of this checklist. Also provide documentation to demonstrate which alternative and financing scheme combination is the most cost-effective; and a contingency financial plan to be used if the preferred method of financing cannot be implemented. The funding analysis shall be limited to areas identified in the plan as needing improved sewage facilities within five years from the date of the plan submission. (Reference-Title 25, §71.21.a.5.v).

_____ N/A F. Analyze the need for immediate or phased implementation of each alternative proposed in Section V of this checklist including: (Reference-Title 25, §71.21.a.5.vi).

_____ _____ 1. A description of any activities necessary to abate critical public health hazards pending completion of sewage facilities or implementation of sewage management programs. (Reference-Title 25, §71.21.a.5.vi.A).

_____ _____ 2. A description of the advantages, if any, in phasing construction of the facilities or implementation of a sewage management program justifying time schedules for each phase. (Reference-Title 25, §71.21.a.5.vi.B).

_____ 8-1 and 3-1 G. Evaluate administrative organizations and legal authority necessary for plan implementation. (Reference - Title 25, §71.21.a.5.vi.D.).

_____ 7-1 **VII. Institutional Evaluation**

A. Provide an analysis of all existing wastewater treatment authorities, their past actions and present performance including:

_____ _____ 1. Financial and debt status. (Reference-Title 25, §71.61.d.2).

_____ _____ 2. Available staff and administrative resources. (Reference-Title 25, §71.61.d.2)

_____ 7-3 3. Existing legal authority to:

_____ 7-3 a. Implement wastewater planning recommendations. (Reference-Title 25, §71.61.d.2).

_____ 7-1 b. Implement system-wide operation and maintenance activities. (Reference-Title 25, §71.61.d.2).

_____ 3-1 c. Set user fees and take purchasing actions. (Reference-Title 25, §71.61.d.2).

_____ N/A d. Take enforcement actions against ordinance violators. (Reference-Title 25,

§71.61.d.2).

_____	3-1	e. Negotiate agreements with other parties. (Reference-Title 25, §71.61.d.2).
_____	3-1	f. Raise capital for construction and operation and maintenance of facilities. (Reference-Title 25,§71.61.d.2).
_____	7-2	B. Provide an analysis and description of the various institutional alternatives necessary to implement the proposed technical alternatives including:
_____	N/A	1. Need for new municipal departments or municipal authorities. (Reference-Title 25, §71.61.d.2).
_____	3-1	2. Functions of existing and proposed organizations (sewer authorities, onlot maintenance agencies, etc.). (Reference-Title 25, §71.61.d.2).
_____	3-1	3. Cost of administration, implementability, and the capability of the authority/agency to react to future needs. (Reference-Title 25, §71.61.d.2).
_____	N/A	C. Describe all necessary administrative and legal activities to be completed and adopted to ensure the implementation of the recommended alternative including:
_____	N/A	1. Incorporation of authorities or agencies. (Reference-Title 25, §71.61.d.2).
_____	N/A	2. Development of all required ordinances, regulations, standards and inter-municipal agreements. (Reference-Title 25, §71.61.d.2).
_____	N/A	3. Description of activities to provide rights-of-way, easements and land transfers. (Reference-Title 25, §71.61.d.2).
_____	N/A	4. Adoption of other municipal sewage facilities plans. (Reference-Title 25, §71.61.d.2).
_____	8-1	5. Any other legal documents. (Reference-Title 25, §71.61.d.2).
_____	9-1	6. Dates or timeframes for items 1-5 above on the project's implementation schedule.
_____	8-3	D. Identify the proposed institutional alternative for implementing the chosen technical wastewater disposal alternative. Provide justification for choosing the specific institutional alternative considering administrative issues, organizational needs and enabling legal authority. (Reference-Title 25, §71.61.d.2).
_____	9-1	**VIII. Implementation Schedule and Justification for Selected Technical & Institutional Alternatives**
		A. Identify the technical wastewater disposal alternative which best meets the wastewater treatment needs of each study area of the municipality. Justify the choice by providing documentation which shows that it is the best alternative based on:
_____	9-1	1. Existing wastewater disposal needs. (Reference-Title 25, §71.21.a.6).
_____	9-1	2. Future wastewater disposal needs. (five and ten years growth areas). (Reference-Title 25, §71.21.a.6).
_____	8-1	3. Operation and maintenance considerations. (Reference-Title 25, §71.21.a.6).
_____	6-1 through 6-15	4. Cost-effectiveness. (Reference-Title 25, §71.21.a.6).
_____	N/A	5. Available management and administrative systems. (Reference-Title 25, §71.21.a.6).

_____	3-2	6. Available financing methods. (Reference-Title 25, §71.21.a.6).
_____	App. A	7. Environmental soundness and compliance with natural resource planning and preservation programs. (Reference-Title 25, §71.21.a.6).
_____	8-2	B. Designate and describe the capital financing plan chosen to implement the selected alternative(s). Designate and describe the chosen back-up financing plan. (Reference-Title 25, §71.21.a.6)
_____	App A	C. Designate and describe the implementation schedule for the recommended alternative, including justification for any proposed phasing of construction or implementation of a Sewage Management Program. (Reference – Title 25 §71.31d)
		IX. Environmental Report (ER) generated from the Uniform Environmental Review Process (UER)
_____	App A	A. Complete an ER as required by the UER process and as described in the DEP Technical Guidance 381-5511-111. Include this document as "Appendix A" to the Act 537 Plan Update Revision. Note: *An ER is required only for Wastewater projects proposing funding through any of the funding sources identified in the UER.*

Delaware County Planning Department
and the
Delaware County Regional Water
Quality Control Authority

Delaware County Act 537 Western Plan of Study; Chester-Ridley Creek Service Area Update

October 13, 2011

Prepared by
Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, PA 19380

DELAWARE COUNTY PLANNING DEPARTMENT

COURT HOUSE/GOVERNMENT CENTER
201 W. Front St. Media, PA 19063

Office Location: Toal Building, 2nd & Orange Sts., Media, PA 19063
Phone: (610) 891-5200 FAX: (610) 891-5203
E-mail: planning_department@co.delaware.pa.us

COUNCIL

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CHAIRMAN

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VICE CHAIRMAN

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ANDY LEWIS
MARIO J. CIVERA, JR.

JOHN E. PICKETT, AICP
DIRECTOR

June 27, 2011

Mr. John Pickett, AICP
Director
Delaware County Planning Dept.
Court House and Government Center Bldg.
201 West Front Street
Media, PA 19063

Re: Act 537 Plan Update – Western Delaware County, Chester-Ridley Creek Service Area

Dear Mr. Pickett:

The Delaware County Planning Department (DCPD) staff has completed a review of the Western Delaware County Act 537 Plan Update for the Chester-Ridley Creek Service Area, prepared by Weston Solutions, Inc. for DCPD and the Delaware County Regional Water Quality Control Authority (DELCORA). The purpose of this plan update was to evaluate options for the long-term treatment of sewage flows generated in the Chester-Ridley Creek Service Area. The recommended alternative is to discontinue operation of the Baldwin Run Plant, and to construct a pump station and force main to direct sewage flows to DELCORA's Western Regional Treatment Plant located in the City of Chester via Force Main Alternative 2C (as identified in the Plan.).

DCPD has participated in the preparation of this plan update and supports its implementation. We also trust that all actions taken in support of its implementation will be undertaken in compliance with local, state, and federal laws and regulations. If you have any questions, please do not hesitate to contact me at 610-891-5214.

Very truly yours,

Steven R. Beckley, AICP
Senior Planner

Cc: Karen Holm, DCPD
Joseph Salvucci, DELCORA

TOWNSHIP OF EDGMONT

1000 Gradyville Road
PO Box 267
Gradyville, Pennsylvania 19039
610-459-1662 phone 610-459-3760 fax

July 18, 2011

Mr. Ronald Gravina, Chairman
Edgmont Township Board of Supervisors
1000 Gradyville Road
P.O. Box 267
Gradyville, PA 19039

RE: Act 537 Sewage Facilities Plan Update Review – Western Plan of Study, Chester-Ridley Creek Service Area

Dear Mr. Gravina:

I am writing in response to your request for review comments on the plan noted above. The Edgmont Township Planning Commission has no comments on the plan update, and recommends its approval by the Edgmont Township Board of Supervisors.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

E.E. "Chip" Miller III
Chairman, Edgmont Township Planning Commission

Township of Chester
1150 Engle Street
Chester, Pennsylvania 19013-2418
(610) 494-4149
Fax (610) 494-4914

July 6, 2011

John E. Pickett, AICP
Director
Delaware County Planning Department
Court House and Government Center Bldg.
201 West Front Street
Media, PA 19063

Re: Act 537 Sewage Facilities Plan Update Review- Western Plan Of Study, Chester-Ridley Creek Service Area

Dear Mr. Pickett:

I am writing in response to your request for review comments on the plan noted above. The Township of Chester Planning Commission has no comments on the plan update, and recommends its approval by the Council of the Township of Chester.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

Tanya Haman

Tanya Haman, Chairperson

Chester Heights Planning Commission

28 July 2011

To: Sue Timmins

Subject: Act 537 Sewage Facilities Plan Grant Application

Reference: a). Delaware County Planning Commission letter from John E Pickett: Resolution Adopting the Delaware County Sewage Facilities Plan.....
b). Mike Ciooc transmittal of the Delaware County Act 537 Western Plan of Study....

Reference (a) provided a resolution adopting a County sewage facilities plan update. The resolution requested that appropriate municipal officials, including the planning commission, provide findings and recommendations for the update plan. The update plan was distributed Reference (b).

The Chester Heights Borough Planning Commission reviewed the reference materials with Mike Ciooco in the July Commission meeting and with Matt Houtmann in the August meeting.

The Planning Commission has no comments or recommendations and recommends Borough Council approval of the Reference (a) resolution.

Approved by: Chris Leiser

Prepared by: Ed Schagrin

CHESTER CITY PLANNING COMMISSION

CHESTER CITY HALL
1 Fourth Street
Chester , PA 19013
610 447-7707

August 10, 2011

Wendell N. Butler Jr.
Mayor
1 Fourth Street
Chester, PA 19013

RE: Act 537 Sewage Facilities Plan Update Review – Western Plan of Study\
Chester-Ridley Creek Service Area

Dear Mayor Butler:

I am writing in response to your request for review comments on the plan referenced above. The Chester City Planning Commission has no comments on the plan update, and recommends its approval by the Chester City Council.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission reviews.

Very truly yours,

James Turner
Chairman

Cc: John E. Pickett, AICP

ASTON TOWNSHIP

RICHARD LEHR
Township Secretary/Manager

ELIZABETH NAUGHTON BECK
Township Solicitor

JOSEPH J. VISCUSO
Township Engineer

5021 PENNELL ROAD
ASTON, PENNSYLVANIA 19014-1896
(610) 494-1636 Fax (610) 494-1065
E-MAIL astontownship.net

July 19, 2011

Mr. John Pickett, Chairman
Delaware County Planning Department
Government Center Building
201 W. Front Street
Media, PA 19063

RE: Act 537 Sewage Facilities Plan Update Review – Western Plan of Study, Chester-Ridley Creek Service Area

Dear Mr. Pickett:

I am writing in response to your request for review comments on the plan noted above. The Aston Township Planning Commission has no comments on the plan update, and recommends its approval by the Aston Township Board of Commissioners.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

Joseph McColgan

Joseph McColgan, Chairman
Aston Township Planning Commission

TOWNSHIP OF MIDDLETOWN

(DELAWARE COUNTY)

(610) 565-2700 **P.O. BOX 157, LIMA, PA 19037-0157** FAX (610) 566-3640

July 14, 2011

Scott D. Galloway, Council Chairman
Middletown Township
P.O. Box 157
Lima, PA 19037

Re: Act 537 Sewage Facilities Plan Update Review –
Western Plan of Study, Chester-Ridley Creek Service Area

Dear Scott,

I am writing in response to your request for review comments on the plan noted above. The Middletown Township Planning Commission has reviewed the above plan and has no comments on the plan update, and recommends its approval by the Middletown Township Council.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

David DiFebo
Planning Commission Chairman

DF:sbs

Upper Providence Township

935 N. Providence Rd., Media, PA 19063
(610) 565-4944 • FAX (610) 565-8924

July 13, 2011

Jack Whelan, Chairman
Delaware County Council
Delaware County Planning Department
201 W. Front Street
Media, PA 19063

RE: Act 537 Sewage Facilities Plan Update Review – Western Plan of Study, Chester-Ridley Creek Service Area

Dear Mr. Whelan:

I am writing in response to your request for review comments on the plan noted above. The Upper Providence Township Planning Commission has no comments on the plan update, and recommends its approval by the Township Council.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

James Martin
Chair
Upper Providence Township Planning Commission

RESOLUTION OF THE TOWNSHIP UPPER CHICHESTER TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA
on the
CONTINUING PLANNING REQUIREMENTS OF ACT 537
PENNSYLVANIA SEWAGE FACILITIES ACT
RESOLUTION NO 2010-32

WHEREAS, The Pennsylvania Sewage Facilities Act, Act No. 537, requires that each municipality in the Commonwealth shall submit to the Department of Environmental Protection of the Commonwealth of Pennsylvania an officially adopted plan for providing adequate sewage facilities for areas within its jurisdiction; and

WHEREAS, the Act further requires that each municipality shall from time to time submit revisions of such plan as many be required by rules and regulations adopted as described in the Act or by order of the Department of Environmental Protection; and

WHEREAS, the Delaware County Planning Department, in 2004, prepared a Sewage Facilities Plan Revision: Western Plan of Study, which was adopted by the County's western municipalities as its official Sewage Facilities Plan as required under Act 537; and

WHEREAS, the Department of Environmental Protection has approved a Plan of Study for an update revision to the 2004 Sewage Facilities Plan for the western half of Delaware County in order to direct flows from the Southwest Delaware County Municipal Authority service area to the Delaware County Regional Water Quality Control Authority (DELCORA) wastewater treatment facility in Chester City. Municipalities in the Southwest Delaware County Municipal Authority service area include Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; and

WHEREAS, the DELCORA Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester will be the recipient of additional flow via a newly constructed force main; and

WHEREAS, the Delaware County Planning Department has invited the municipalities in western Delaware County to participate in the preparation of this plan at no cost to the municipalities.

NOW, THEREFORE, BE IT RESOLVED THAT the Board of Commissioners of the Upper Chichester Township hereby agree that at this time, the continuing planning requirements of Act 537 should be accomplished at the multi-municipal level by the Delaware County Planning Department, and that the Board of Commissioners of the Upper Chichester Township will cooperate in the preparation of such a plan, including the provision of access by the County or its designee to its records and, if appropriate, to its sewer lines.

BE IT FURTHER RESOLVED that the plan update revision prepared for the western half of Delaware County, including the Upper Chichester Township, will be considered by the Board of Commissioners of the Upper Chichester Township for adoption as its official Sewage Facilities Plan under Act 537, and that the plan will be submitted by the County to the Department of Environmental Protection for approval.

Duly Adopted this 8th Day of July, 2010.

Board of Commissioners

James R. Stewart

James R. Stewart, President

ATTEST:

Dora A. Coleman, Township Secretary

DCPD

DELAWARE COUNTY PLANNING DEPARTMENT

Court House/ Government Center , 201 W. Front St., Media, PA 19063
Office Location: Toal Building, 2nd & Orange Sts., Media, PA 19063
Phone: (610) 891-5200 FAX: (610) 891-5203
E-mail: planning_department@co.delaware.pa.us

TO : SWDCMA SERVICE AREA
MUNICIPAL MANAGERS/SECRETARIES
GOVERNING BODY CHAIRS
CITY OF CHESTER
MAYOR
CHIEF OF STAFF
PLANNING DIRECTOR

FROM : JOHN E. PICKETT, AICP
DIRECTOR

SUBJECT : REQUEST FOR AUTHORIZATION TO PREPARE AN SEWAGE FACILITIES PLAN OFFICIAL UPDATE REVISION

DATE: : MAY 11, 2010

The Delaware County Planning Department is working with the Delaware County Regional Water Quality Control Authority (DELCORA) to prepare an Act 537 Sewage Facilities Plan update revision for the Delaware County Act 537 Sewage Facilities Plan Revision: Western Plan of Study (2004). The purpose of the update revision is to provide the planning necessary to phase out the Southwest Delaware County Municipal Authority's (SWDCMA) Baldwin Run Sewage Treatment Plant in Aston Township and to direct flows to the Delaware County Regional Water Quality Control Authority's (DELCORA) Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester. The reasons for this diversion include continuing problems associated with meeting current water quality permit requirements, and the potential inability of the plant to meet additional upcoming total maximum daily load (TMDL) requirements for Chester Creek.

Affected municipalities include: Aston, Chester, Edgmont, Middletown, Upper Chichester, and Upper Providence Townships, and Brookhaven and Chester Heights Boroughs, all of which are tributary to the SWDCMA system. The WRTP located in the City of Chester will be the recipient of

additional flows from a newly constructed force main; therefore, it is included in the project.

We ask you to pass a resolution similar to the draft resolution enclosed, authorizing the Delaware County Planning Department to prepare a multi-municipal official Sewage Facilities Plan update revision meeting the planning requirements of Act 537 on your behalf. Please note that this resolution is NOT an acceptance of the plan. Each municipality will be asked to review and provide comments on the document before being asked to consider its adoption at a later date.

If you have any questions or would like an electronic version of the resolution for your use, please feel free to contact Karen Holm of my staff by phone at 610-891-5213, or by email at holmk@co.delaware.pa.us.

cc: Sewage Facilities Planning Team

MIDDLETOWN TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA

RESOLUTION 2010-.62

On The

CONTINUING PLANNING REQUIREMENTS OF ACT 537
PENNSYLVANIA SEWAGE FACILITIES ACT

WHEREAS, The Pennsylvania Sewage Facilities Act, Act No. 537, requires that each municipality in the Commonwealth shall submit to the Department of Environmental Protection of the Commonwealth of Pennsylvania an officially adopted plan for providing adequate sewage facilities for areas within its jurisdiction; and

WHEREAS, the Act further requires that each municipality shall from time to time submit revisions of such plan as may be required by rules and regulations adopted as described in the Act or by order of the Department of Environmental Protection; and

WHEREAS, the Delaware County Planning Department, in 2004, prepared a Sewage Facilities Plan Revision: Western Plan of Study, which was adopted by the County's western municipalities as its official Sewage Facilities Plan as required under Act 537; and

WHEREAS, the Department of Environmental Protection has approved a Plan of Study for an update revision to the 2004 Sewage Facilities Plan for the western half of Delaware County in order to direct flows from the Southwest Delaware County Municipal Authority service area to the Delaware County Regional Water Quality Control Authority (DELCORA) wastewater treatment facility in Chester City. Municipalities in the Southwest Delaware County Municipal Authority service area include Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; and

WHEREAS, the DELCORA Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester will be the recipient of additional flow via a newly constructed force main; and

WHEREAS, the Delaware County Planning Department has invited the municipalities in western Delaware County to participate in the preparation of this plan at no cost to the municipalities,

NOW, THEREFORE, BE IT RESOLVED THAT the Council of the Township of Middletown hereby agrees that at this time, the continuing planning requirements of Act 537 should be accomplished at the multi-municipal level by the Delaware County

Planning Department, and that the Council of the Township of Middletown will cooperate in the preparation of such a plan, including the provision of access by the County or its designee to its records and, if appropriate, to its sewer lines.

BE IT FURTHER RESOLVED that the plan update revision prepared for the western half of Delaware County, including the Township of Middletown, will be considered by the Council of the Township of Middletown for adoption as its official Sewage Facilities Plan under Act 537, and that the plan will be submitted by the County to the Department of Environmental Protection for approval.

Resolved this 14th day of June, 2010.

SIGNED: _____
SCOTT GALLOWAY, ESQUIRE
MIDDLETOWN COUNCIL CHAIRMAN

ATTEST: _____
MEREDITH F. MERINO
ASSISTANT TOWNSHIP MANAGER

EDGMONT TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA

RESOLUTION NO. 10 – 16

A RESOLUTION OF THE TOWNSHIP OF EDGMONT TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA, REGARDING THE CONTINUING ACT 537 PLANNING AT THE MULTI-MUNICIPAL LEVEL BY DELAWARE COUNTY

WHEREAS, the Pennsylvania State Sewage Facilities Act, Act No. 537 (the "**Act**"), requires that each municipality in the Commonwealth of Pennsylvania submit to the Department of Environmental Protection ("**DEP**"), an officially adopted plan for providing adequate sewage facilities for the municipality; and

WHEREAS, the Act further requires that each municipality shall from time to time submit revisions of such plans to DEP; and

WHEREAS, the Delaware County Planning Department ("**DCPD**"), in 2004 prepared a Sewage Facilities Plan Revision: Western Plan of Study (the "**2004 Plan**"), which was recognized by the Township of Edgmont (the "**Township**"), pursuant to Township Resolution No. 04-18; and

WHEREAS, DEP has approved a Plan of Study for an update revision to the 2004 Plan (the "**537 Revision**") in order to direct sewage flows from the Southwest Delaware County Municipal Authority ("**SWDCMA**") service area to the Delaware County Regional Water Quality Control Authority ("**DELCORA**") wastewater treatment facility in the City of Chester; and

WHEREAS, the Township has heretofore approved a 22-lot residential development with the intended method of sewage disposal being SWDCMA; and

WHEREAS, DCPD has invited the Township to participate in the preparation of the 537 Revision at no cost to the Township.

NOW, THEREFORE, BE IT HEREBY RESOLVED, by the Board of Supervisors of Edgmont Township Delaware County Pennsylvania, as follows:

RESOLVED, that the Township will cooperate in the preparation of the 537 Revision, including the provision of access by the DCPD or its designee to its records, so long as there is no cost to the Township; and

BE IT FURTHER RESOLVED, that the 537 Revision will be considered by the Township for recognition and the County of Delaware shall submit the 537 Revision to DEP for approval; and

BE IT FURTHER RESOLVED, that this Resolution shall not be deemed to be a delegation of the Township's authority to enforce, administer or revise the official Edgmont Township Act 537 Plan, as amended; and

BE IT FURTHER RESOLVED, that the Township shall continue to implement, administer, enforce and revise the official Edgmont Township Act 537 Plan.

RESOLVED and **ADOPTED** this 19th day of May, 2010.

EDGMONT TOWNSHIP
BOARD OF SUPERVISORS

RONALD GRAVINA, CHAIRMAN

JOSEPH CONAN, VICE CHAIRMAN

WILLIAM "CHIP" MACKRIDES, MEMBER

I, Samantha Reiner, Secretary to The Township of Edgmont Board of Supervisors hereby certify that the foregoing is a true copy of the Township's Resolution No. 10 – 16, adopted May 19th, 2010.

SAMANTHA REINER, SECRETARY/MANAGER

(TOWNSHIP SEAL)

RESOLUTION OF THE BOROUGH OF CHESTER HEIGHTS

DELAWARE COUNTY, PENNSYLVANIA

on the

CONTINUING PLANNING REQUIREMENTS OF ACT 537 PENNSYLVANIA SEWAGE FACILITIES ACT

WHEREAS, The Pennsylvania Sewage Facilities Act, Act No. 537, requires that each municipality in the Commonwealth shall submit to the Department of Environmental Protection of the Commonwealth of Pennsylvania an officially adopted plan for providing adequate sewage facilities for areas within its jurisdiction; and

WHEREAS the Act further requires that each municipality shall from time to time submit revisions of such plan as many be required by rules and regulations adopted as described in the Act or by order of the Department of Environmental Protection; and

WHEREAS, the Delaware County Planning Department, in 2004, prepared a Sewage Facilities Plan Revision: Western Plan of Study, which was adopted by the County's western municipalities as its official Sewage Facilities Plan as required under Act 537; and

WHEREAS the Department of Environmental Protection has approved a Plan of Study for an update revision to the 2004 Sewage Facilities Plan for the western half of Delaware County in order to direct flows from the Southwest Delaware County Municipal Authority service area to the Delaware County Regional Water Quality Control Authority (DELCORA) wastewater treatment facility in Chester City. Municipalities in the Southwest Delaware County Municipal Authority service area include Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; and

WHEREAS the DELCORA Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester will be the recipient of additional flow via a newly constructed force main; and

WHEREAS the Delaware County Planning Department has invited the municipalities in western Delaware County to participate in the preparation of this plan at no cost to the municipalities.

NOW, THEREFORE, BE IT RESOLVED THAT the Council of the Borough of Chester Heights hereby agree that at this time, the continuing planning requirements of Act 537 should be accomplished at the multi-municipal level by the Delaware County Planning Department, and that the Council of the Borough of Chester Heights will cooperate in the preparation of such a plan, including the provision of access by the County or its designee to its records and, if appropriate, to its sewer lines.

BE IT FURTHER RESOLVED that the plan update revision prepared for the western half of Delaware County, including the Borough of Chester Heights, will be considered by the Council of the Borough of Chester Heights for adoption as its official Sewage Facilities Plan under Act 537, and that the plan will be submitted by the County to the Department of Environmental Protection for approval.

ATTEST:

President
BOROUGH COUNCIL

Susan M. Seminaris
SECRETARY

RESOLUTION

CITY OF CHESTER
DELAWARE COUNTY, PENNSYLVANIA

On the

CONTINUING PLANNING REQUIREMENTS OF ACT 537

PENNSYLVANIA SEWAGE FACILITIES ACT

WHEREAS, The Pennsylvania Sewage Facilities Act, Act No. 537, requires that each municipality in the Commonwealth shall submit to the Department of Environmental Protection of the Commonwealth of Pennsylvania an officially adopted plan for providing adequate sewage facilities for areas within its jurisdiction; and

WHEREAS the Act further requires that each municipality shall from time to time submit revisions of such plan as many be required by rules and regulations adopted as described in the Act or by order of the Department of Environmental Protection; and

WHEREAS, the Delaware County Planning Department, in 2004, prepared a Sewage Facilities Plan Revision: Western Plan of Study, which was adopted by the County's western municipalities as its official Sewage Facilities Plan as required under Act 537; and

WHEREAS, the Department of Environmental Protection has approved a Plan of Study for an update revision to the 2004 Sewage Facilities Plan for the western half of Delaware County in order to direct flows from the Southwest Delaware County Municipal Authority service area to the Delaware County Regional Water Quality Control Authority (DELCORA) wastewater treatment facility in Chester City. Municipalities in the Southwest Delaware County Municipal Authority service area include Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; and

WHEREAS, the DELCORA Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester will be the recipient of additional flow via a newly constructed force main; and

WHEREAS, the Delaware County Planning Department has invited the municipalities in western Delaware County to participate in the preparation of this plan at no cost to the municipalities.

NOW, THEREFORE, BE IT RESOLVED THAT the Council of the

City of Chester hereby agree that at this time, the continuing planning requirements of Act 537 should be accomplished at the multi-municipal level by the Delaware County Planning Department, and that the Council of the City of Chester will cooperate in the preparation of such plan, including the provision of access by the County or its designee to its records and, if appropriate, to its sewer lines.

BE IT FURTHER RESOLVED that the plan update revision prepared for the western half of Delaware County, including the City of Chester, will be considered by the Council of City of Chester for adoption as its official Sewage Facilities Plan under Act 537, and that the plan will be submitted by the County to the Department of Environmental Protection for approval.

ATTEST:

Wardell N. Brooks Jr.
MAYOR

Janell Brown
Acting **CITY CLERK**

BOROUGH OF BROOKHAVEN
COMMONWEALTH OF PENNSYLVANIA
RESOLUTION NO. 2010- 05

CONTINUING PLANNING REQUIREMENTS OF ACT 537
PENNSYLVANIA SEWAGE FACILITIES ACT

WHEREAS, The Pennsylvania Sewage Facilities Act, Act No. 537, requires that each municipality in the Commonwealth shall submit to the Department of Environmental Protection of the Commonwealth of Pennsylvania an officially adopted plan for providing adequate sewage facilities for areas within its jurisdiction; and

WHEREAS the Act further requires that each municipality shall from time to time submit revisions of such plan as many be required by rules and regulations adopted as described in the Act or by order of the Department of Environmental Protection; and

WHEREAS, the Delaware County Planning Department, in 2004, prepared a Sewage Facilities Plan Revision: Western Plan of Study, which was adopted by the County's western municipalities as its official Sewage Facilities Plan as required under Act 537; and

WHEREAS the Department of Environmental Protection has approved a Plan of Study for an update revision to the 2004 Sewage Facilities Plan for the western half of Delaware County in order to consider diverting flows from the Southwest Delaware County Municipal Authority service area to the Delaware County Regional Water Quality Control Authority (DELCORA) wastewater treatment facility in Chester City. Municipalities in the Southwest Delaware County Municipal Authority service area include Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; and

WHEREAS the DELCORA Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester will be the recipient of additional flow via a newly constructed force main; and

WHEREAS the Delaware County Planning Department has invited the municipalities in western Delaware County to participate in the preparation of this plan at no cost to the municipalities.

NOW, THEREFORE, BE IT RESOLVED THAT the Council of the Borough of Brookhaven hereby agree that at this time, the continuing planning requirements of Act 537 should be accomplished at the multi-municipal level by the Delaware County Planning Department, and that the Council of the Borough of Brookhaven will cooperate in the preparation of such a plan, including the provision of access by the County or its designee to its records and, if appropriate, to its sewer lines.

BE IT FURTHER RESOLVED that the plan update revision prepared for the western half of Delaware County, including the service area located in the Borough of Brookhaven, will be considered by the Council of the Borough of Brookhaven for adoption as its official Sewage Facilities Plan under Act 537, and that the plan, if and when adopted, will be submitted by the County to the Department of Environmental Protection for approval.

RESOLVED, this 7th day of June, 2010.

BROOKHAVEN BOROUGH COUNCIL

John J. Wilwert, Jr.
Council President

Michael S. Hess, Mayor

ATTEST: Mary Ellen McKinley
Mary Ellen McKinley, Secretary

TOWNSHIP OF ASTON
DELAWARE COUNTY, PENNSYLVANIA

RESOLUTION NO. 2010 - 83

ON THE

CONTINUING PLANNING REQUIREMENTS OF ACT 537
PENNSYLVANIA SEWAGE FACILITIES ACT

WHEREAS, The Pennsylvania Sewage Facilities Act, Act No. 537, requires that each municipality in the Commonwealth shall submit to the Department of Environmental Protection of the Commonwealth of Pennsylvania an officially adopted plan for providing adequate sewage facilities for areas within its jurisdiction; and

WHEREAS, the Act further requires that each municipality shall from time to time submit revisions of such plan as may be required by rules and regulations adopted as described in the Act or by order of the Department of Environmental Protection; and

WHEREAS, the Delaware County Planning Department, in 2004, prepared a Sewage Facilities Plan Revision: Western Plan of Study, which was adopted by the County's western municipalities as its official Sewage Facilities Plan as required under Act 537; and

WHEREAS, the Department of Environmental Protection has approved a Plan of Study for an update revision to the 2004 Sewage Facilities Plan for the western half of Delaware County in order to direct flows from the Southwest Delaware County Municipal Authority service area to the Delaware County Regional Water Quality Control Authority (DELCORA) wastewater treatment facility in Chester City. Municipalities in the Southwest Delaware County Municipal Authority service area include Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; and

WHEREAS, the DELCORA Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester will be the recipient of additional flow via a newly constructed force main; and

WHEREAS, the Delaware County Planning Department has invited the municipalities in western Delaware County to participate in the preparation of this plan at no cost to the municipalities.

NOW, THEREFORE, BE IT RESOLVED THAT the Board of Commissioners of the Township of Aston hereby agree that at this time, the continuing planning requirements of Act 537 should be accomplished at the multi-municipal level by the Delaware County Planning Department, and that the Board of Commissioners of the Township of Aston will cooperate in the preparation of such a plan, including the provision of access by the County or its designee to its records and, if appropriate, to its sewer lines.

BE IT FURTHER RESOLVED that the plan update revision prepared for the western half of Delaware County, including the Township of Aston, will be considered by the Board of Commissioners of the Township of Aston for adoption as its official Sewage Facilities Plan under Act 537, and that the plan will be submitted by the County to the Department of Environmental Protection for approval.

BY: _____
Gary C. Robinson, President
Board of Commissioners

ATTEST: _____
Richard D. Lehr
Secretary/Manager

UPPER PROVIDENCE TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA
on the
CONTINUING PLANNING REQUIREMENTS OF ACT 537
PENNSYLVANIA SEWAGE FACILITIES ACT

Resolution No. 2010-10

WHEREAS, The Pennsylvania Sewage Facilities Act, Act No. 537, requires that each municipality in the Commonwealth shall submit to the Department of Environmental Protection of the Commonwealth of Pennsylvania an officially adopted plan for providing adequate sewage facilities for areas within its jurisdiction; and

WHEREAS the Act further requires that each municipality shall from time to time submit revisions of such plan as many be required by rules and regulations adopted as described in the Act or by order of the Department of Environmental Protection; and

WHEREAS, the Delaware County Planning Department, in 2004, prepared a Sewage Facilities Plan Revision: Western Plan of Study, which was adopted by the County's western municipalities as its official Sewage Facilities Plan as required under Act 537; and

WHEREAS the Department of Environmental Protection has approved a Plan of Study for an update revision to the 2004 Sewage Facilities Plan for the western half of Delaware County in order to direct flows from the Southwest Delaware County Municipal Authority service area to the Delaware County Regional Water Quality Control Authority (DELCORA) wastewater treatment facility in Chester City. Municipalities in the Southwest Delaware County Municipal Authority service area include Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; and

WHEREAS the DELCORA Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester will be the recipient of additional flow via a newly constructed force main; and

WHEREAS the Delaware County Planning Department has invited the municipalities in western Delaware County to participate in the preparation of this plan at no cost to the municipalities.

NOW, THEREFORE, BE IT RESOLVED THAT the Council of the Township of Upper Providence hereby agree that at this time, the continuing planning requirements of Act 537 should be accomplished at the multi-municipal level by the Delaware County Planning Department, and that the Council of the Township of Upper Providence will cooperate in the preparation of such a plan, including the provision of access by the County or its designee to its records and, if appropriate, to its sewer lines.

BE IT FURTHER RESOLVED that the plan update revision prepared for the western half of Delaware County, including the Township of Upper Providence, will be considered by the Council of the Township of Upper Providence for adoption as its official Sewage Facilities Plan under Act 537, and that the plan will be submitted by the County to the Department of Environmental Protection for approval.

COUNCIL CHAIR
UPPER PROVIDENCE TOWNSHIP

ATTEST:

SECRETARY

UPPER PROVIDENCE TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA
on the
CONTINUING PLANNING REQUIREMENTS OF ACT 537
PENNSYLVANIA SEWAGE FACILITIES ACT

Resolution No. 2010-10

WHEREAS, The Pennsylvania Sewage Facilities Act, Act No. 537, requires that each municipality in the Commonwealth shall submit to the Department of Environmental Protection of the Commonwealth of Pennsylvania an officially adopted plan for providing adequate sewage facilities for areas within its jurisdiction; and

WHEREAS the Act further requires that each municipality shall from time to time submit revisions of such plan as many be required by rules and regulations adopted as described in the Act or by order of the Department of Environmental Protection; and

WHEREAS, the Delaware County Planning Department, in 2004, prepared a Sewage Facilities Plan Revision: Western Plan of Study, which was adopted by the County's western municipalities as its official Sewage Facilities Plan as required under Act 537; and

WHEREAS the Department of Environmental Protection has approved a Plan of Study for an update revision to the 2004 Sewage Facilities Plan for the western half of Delaware County in order to direct flows from the Southwest Delaware County Municipal Authority service area to the Delaware County Regional Water Quality Control Authority (DELCORA) wastewater treatment facility in Chester City. Municipalities in the Southwest Delaware County Municipal Authority service area include Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; and

WHEREAS the DELCORA Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester will be the recipient of additional flow via a newly constructed force main; and

WHEREAS the Delaware County Planning Department has invited the municipalities in western Delaware County to participate in the preparation of this plan at no cost to the municipalities.

NOW, THEREFORE, BE IT RESOLVED THAT the Council of the Township of Upper Providence hereby agree that at this time, the continuing planning requirements of Act 537 should be accomplished at the multi-municipal level by the Delaware County Planning Department, and that the Council of the Township of Upper Providence will cooperate in the preparation of such a plan, including the provision of access by the County or its designee to its records and, if appropriate, to its sewer lines.

BE IT FURTHER RESOLVED that the plan update revision prepared for the western half of Delaware County, including the Township of Upper Providence, will be considered by the Council of the Township of Upper Providence for adoption as its official Sewage Facilities Plan under Act 537, and that the plan will be submitted by the County to the Department of Environmental Protection for approval.

COUNCIL CHAIR
UPPER PROVIDENCE TOWNSHIP

ATTEST:

SECRETARY

RESOLUTION OF THE TOWNSHIP UPPER CHICHESTER TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA
on the
CONTINUING PLANNING REQUIREMENTS OF ACT 537
PENNSYLVANIA SEWAGE FACILITIES ACT
RESOLUTION NO 2010-32

WHEREAS, The Pennsylvania Sewage Facilities Act, Act No. 537, requires that each municipality in the Commonwealth shall submit to the Department of Environmental Protection of the Commonwealth of Pennsylvania an officially adopted plan for providing adequate sewage facilities for areas within its jurisdiction; and

WHEREAS, the Act further requires that each municipality shall from time to time submit revisions of such plan as many be required by rules and regulations adopted as described in the Act or by order of the Department of Environmental Protection; and

WHEREAS, the Delaware County Planning Department, in 2004, prepared a Sewage Facilities Plan Revision: Western Plan of Study, which was adopted by the County's western municipalities as its official Sewage Facilities Plan as required under Act 537; and

WHEREAS, the Department of Environmental Protection has approved a Plan of Study for an update revision to the 2004 Sewage Facilities Plan for the western half of Delaware County in order to direct flows from the Southwest Delaware County Municipal Authority service area to the Delaware County Regional Water Quality Control Authority (DELCORA) wastewater treatment facility in Chester City. Municipalities in the Southwest Delaware County Municipal Authority service area include Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Edgmont Township, Middletown Township, Upper Chichester Township, and Upper Providence Township; and

WHEREAS, the DELCORA Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester will be the recipient of additional flow via a newly constructed force main; and

WHEREAS, the Delaware County Planning Department has invited the municipalities in western Delaware County to participate in the preparation of this plan at no cost to the municipalities.

NOW, THEREFORE, BE IT RESOLVED THAT the Board of Commissioners of the Upper Chichester Township hereby agree that at this time, the continuing planning requirements of Act 537 should be accomplished at the multi-municipal level by the Delaware County Planning Department, and that the Board of Commissioners of the Upper Chichester Township will cooperate in the preparation of such a plan, including the provision of access by the County or its designee to its records and, if appropriate, to its sewer lines.

BE IT FURTHER RESOLVED that the plan update revision prepared for the western half of Delaware County, including the Upper Chichester Township, will be considered by the Board of Commissioners of the Upper Chichester Township for adoption as its official Sewage Facilities Plan under Act 537, and that the plan will be submitted by the County to the Department of Environmental Protection for approval.

Duly Adopted this 8th Day of July, 2010.

Board of Commissioners

James R. Stewart

James R. Stewart, President

ATTEST:

Dora A. Coleman, Township Secretary

DCPD

DELAWARE COUNTY PLANNING DEPARTMENT

Court House/ Government Center , 201 W. Front St., Media, PA 19063
Office Location: Toal Building, 2nd & Orange Sts., Media, PA 19063
Phone: (610) 891-5200 FAX: (610) 891-5203
E-mail: planning_department@co.delaware.pa.us

TO : SWDCMA SERVICE AREA
MUNICIPAL MANAGERS/SECRETARIES
GOVERNING BODY CHAIRS
CITY OF CHESTER
MAYOR
CHIEF OF STAFF
PLANNING DIRECTOR

FROM : JOHN E. PICKETT, AICP
DIRECTOR

SUBJECT : REQUEST FOR AUTHORIZATION TO PREPARE AN SEWAGE FACILITIES PLAN OFFICIAL UPDATE REVISION

DATE: : MAY 11, 2010

The Delaware County Planning Department is working with the Delaware County Regional Water Quality Control Authority (DELCORA) to prepare an Act 537 Sewage Facilities Plan update revision for the Delaware County Act 537 Sewage Facilities Plan Revision: Western Plan of Study (2004). The purpose of the update revision is to provide the planning necessary to phase out the Southwest Delaware County Municipal Authority's (SWDCMA) Baldwin Run Sewage Treatment Plant in Aston Township and to direct flows to the Delaware County Regional Water Quality Control Authority's (DELCORA) Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester. The reasons for this diversion include continuing problems associated with meeting current water quality permit requirements, and the potential inability of the plant to meet additional upcoming total maximum daily load (TMDL) requirements for Chester Creek.

Affected municipalities include: Aston, Chester, Edgmont, Middletown, Upper Chichester, and Upper Providence Townships, and Brookhaven and Chester Heights Boroughs, all of which are tributary to the SWDCMA system. The WRTP located in the City of Chester will be the recipient of

additional flows from a newly constructed force main; therefore, it is included in the project.

We ask you to pass a resolution similar to the draft resolution enclosed, authorizing the Delaware County Planning Department to prepare a multi-municipal official Sewage Facilities Plan update revision meeting the planning requirements of Act 537 on your behalf. Please note that this resolution is NOT an acceptance of the plan. Each municipality will be asked to review and provide comments on the document before being asked to consider its adoption at a later date.

If you have any questions or would like an electronic version of the resolution for your use, please feel free to contact Karen Holm of my staff by phone at 610-891-5213, or by email at holmk@co.delaware.pa.us.

cc: Sewage Facilities Planning Team

EDGMONT TOWNSHIP
DELAWARE COUNTY, PENNSYLVANIA

RESOLUTION NO. 10 – 16

A RESOLUTION OF THE TOWNSHIP OF EDGMONT TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA, REGARDING THE CONTINUING ACT 537 PLANNING AT THE MULTI-MUNICIPAL LEVEL BY DELAWARE COUNTY

WHEREAS, the Pennsylvania State Sewage Facilities Act, Act No. 537 (the "**Act**"), requires that each municipality in the Commonwealth of Pennsylvania submit to the Department of Environmental Protection ("**DEP**"), an officially adopted plan for providing adequate sewage facilities for the municipality; and

WHEREAS, the Act further requires that each municipality shall from time to time submit revisions of such plans to DEP; and

WHEREAS, the Delaware County Planning Department ("**DCPD**"), in 2004 prepared a Sewage Facilities Plan Revision: Western Plan of Study (the "**2004 Plan**"), which was recognized by the Township of Edgmont (the "**Township**"), pursuant to Township Resolution No. 04-18; and

WHEREAS, DEP has approved a Plan of Study for an update revision to the 2004 Plan (the "**537 Revision**") in order to direct sewage flows from the Southwest Delaware County Municipal Authority ("**SWDCMA**") service area to the Delaware County Regional Water Quality Control Authority ("**DELCORA**") wastewater treatment facility in the City of Chester; and

WHEREAS, the Township has heretofore approved a 22-lot residential development with the intended method of sewage disposal being SWDCMA; and

WHEREAS, DCPD has invited the Township to participate in the preparation of the 537 Revision at no cost to the Township.

NOW, THEREFORE, BE IT HEREBY RESOLVED, by the Board of Supervisors of Edgmont Township Delaware County Pennsylvania, as follows:

RESOLVED, that the Township will cooperate in the preparation of the 537 Revision, including the provision of access by the DCPD or its designee to its records, so long as there is no cost to the Township; and

BE IT FURTHER RESOLVED, that the 537 Revision will be considered by the Township for recognition and the County of Delaware shall submit the 537 Revision to DEP for approval; and

BE IT FURTHER RESOLVED, that this Resolution shall not be deemed to be a delegation of the Township's authority to enforce, administer or revise the official Edgmont Township Act 537 Plan, as amended; and

BE IT FURTHER RESOLVED, that the Township shall continue to implement, administer, enforce and revise the official Edgmont Township Act 537 Plan.

RESOLVED and **ADOPTED** this 19th day of May, 2010.

EDGMONT TOWNSHIP
BOARD OF SUPERVISORS

RONALD GRAVINA, CHAIRMAN

JOSEPH CONAN, VICE CHAIRMAN

WILLIAM "CHIP" MACKRIDES, MEMBER

I, Samantha Reiner, Secretary to The Township of Edgmont Board of Supervisors hereby certify that the foregoing is a true copy of the Township's Resolution No. 10 – 16, adopted May 19th, 2010.

SAMANTHA REINER, SECRETARY/MANAGER

(TOWNSHIP SEAL)

Upper Providence Township

935 N. Providence Rd., Media, PA 19063
(610) 565-4944 • FAX (610) 565-8924

July 13, 2011

Jack Whelan, Chairman
Delaware County Council
Delaware County Planning Department
201 W. Front Street
Media, PA 19063

RE: Act 537 Sewage Facilities Plan Update Review – Western Plan of Study, Chester-Ridley Creek Service Area

Dear Mr. Whelan:

I am writing in response to your request for review comments on the plan noted above. The Upper Providence Township Planning Commission has no comments on the plan update, and recommends its approval by the Township Council.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

James Martin
Chair
Upper Providence Township Planning Commission

TOWNSHIP OF MIDDLETOWN

(DELAWARE COUNTY)

(610) 565-2700 **P.O. BOX 157, LIMA, PA 19037-0157** FAX (610) 566-3640

July 14, 2011

Scott D. Galloway, Council Chairman
Middletown Township
P.O. Box 157
Lima, PA 19037

Re: Act 537 Sewage Facilities Plan Update Review –
Western Plan of Study, Chester-Ridley Creek Service Area

Dear Scott,

I am writing in response to your request for review comments on the plan noted above. The Middletown Township Planning Commission has reviewed the above plan and has no comments on the plan update, and recommends its approval by the Middletown Township Council.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

David DiFebo
Planning Commission Chairman

DF:sbs

TOWNSHIP OF EDGMONT

1000 Gradyville Road
PO Box 267
Gradyville, Pennsylvania 19039
610-459-1662 phone 610-459-3760 fax

July 18, 2011

Mr. Ronald Gravina, Chairman
Edgmont Township Board of Supervisors
1000 Gradyville Road
P.O. Box 267
Gradyville, PA 19039

RE: Act 537 Sewage Facilities Plan Update Review – Western Plan of Study, Chester-Ridley Creek Service Area

Dear Mr. Gravina:

I am writing in response to your request for review comments on the plan noted above. The Edgmont Township Planning Commission has no comments on the plan update, and recommends its approval by the Edgmont Township Board of Supervisors.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

E.E. "Chip" Miller III
Chairman, Edgmont Township Planning Commission

DELAWARE COUNTY PLANNING DEPARTMENT

COURT HOUSE/GOVERNMENT CENTER
201 W. Front St. Media, PA 19063

Office Location: Toal Building, 2nd & Orange Sts., Media, PA 19063
Phone: (610) 891-5200 FAX: (610) 891-5203
E-mail: planning_department@co.delaware.pa.us

COUNCIL

JOHN J. WHELAN
CHAIRMAN

CHRISTINE FIZZANO CANNON
VICE CHAIRMAN

THOMAS J. McGARRIGLE
ANDY LEWIS
MARIO J. CIVERA, JR.

JOHN E. PICKETT, AICP
DIRECTOR

June 27, 2011

Mr. John Pickett, AICP
Director
Delaware County Planning Dept.
Court House and Government Center Bldg.
201 West Front Street
Media, PA 19063

Re: Act 537 Plan Update – Western Delaware County, Chester-Ridley Creek Service Area

Dear Mr. Pickett:

The Delaware County Planning Department (DCPD) staff has completed a review of the Western Delaware County Act 537 Plan Update for the Chester-Ridley Creek Service Area, prepared by Weston Solutions, Inc. for DCPD and the Delaware County Regional Water Quality Control Authority (DELCORA). The purpose of this plan update was to evaluate options for the long-term treatment of sewage flows generated in the Chester-Ridley Creek Service Area. The recommended alternative is to discontinue operation of the Baldwin Run Plant, and to construct a pump station and force main to direct sewage flows to DELCORA's Western Regional Treatment Plant located in the City of Chester via Force Main Alternative 2C (as identified in the Plan.).

DCPD has participated in the preparation of this plan update and supports its implementation. We also trust that all actions taken in support of its implementation will be undertaken in compliance with local, state, and federal laws and regulations. If you have any questions, please do not hesitate to contact me at 610-891-5214.

Very truly yours,

Steven R. Beckley, AICP
Senior Planner

Cc: Karen Holm, DCPD
Joseph Salvucci, DELCORA

Township of Chester
1150 Engle Street
Chester, Pennsylvania 19013-2418
(610) 494-4149
Fax (610) 494-4914

July 6, 2011

John E. Pickett, AICP
Director
Delaware County Planning Department
Court House and Government Center Bldg.
201 West Front Street
Media, PA 19063

Re: Act 537 Sewage Facilities Plan Update Review- Western Plan Of Study, Chester-Ridley Creek Service Area

Dear Mr. Pickett:

I am writing in response to your request for review comments on the plan noted above. The Township of Chester Planning Commission has no comments on the plan update, and recommends its approval by the Council of the Township of Chester.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

Tanya Haman

Tanya Haman, Chairperson

Chester Heights Planning Commission

28 July 2011

To: Sue Timmins

Subject: Act 537 Sewage Facilities Plan Grant Application

Reference: a). Delaware County Planning Commission letter from John E Pickett: Resolution Adopting the Delaware County Sewage Facilities Plan.....
b). Mike Ciooc transmittal of the Delaware County Act 537 Western Plan of Study....

Reference (a) provided a resolution adopting a County sewage facilities plan update. The resolution requested that appropriate municipal officials, including the planning commission, provide findings and recommendations for the update plan. The update plan was distributed Reference (b).

The Chester Heights Borough Planning Commission reviewed the reference materials with Mike Ciooco in the July Commission meeting and with Matt Houtmann in the August meeting.

The Planning Commission has no comments or recommendations and recommends Borough Council approval of the Reference (a) resolution.

Approved by: Chris Leiser

Prepared by: Ed Schagrin

CHESTER CITY PLANNING COMMISSION

CHESTER CITY HALL
1 Fourth Street
Chester , PA 19013
610 447-7707

August 10, 2011

Wendell N. Butler Jr.
Mayor
1 Fourth Street
Chester, PA 19013

RE: Act 537 Sewage Facilities Plan Update Review – Western Plan of Study\
Chester-Ridley Creek Service Area

Dear Mayor Butler:

I am writing in response to your request for review comments on the plan referenced above. The Chester City Planning Commission has no comments on the plan update, and recommends its approval by the Chester City Council.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission reviews.

Very truly yours,

James Turner
Chairman

Cc: John E. Pickett, AICP

ASTON TOWNSHIP

RICHARD LEHR
Township Secretary/Manager

ELIZABETH NAUGHTON BECK
Township Solicitor

JOSEPH J. VISCUSO
Township Engineer

5021 PENNELL ROAD
ASTON, PENNSYLVANIA 19014-1896
(610) 494-1636 Fax (610) 494-1065
E-MAIL astontownship.net

July 19, 2011

Mr. John Pickett, Chairman
Delaware County Planning Department
Government Center Building
201 W. Front Street
Media, PA 19063

RE: Act 537 Sewage Facilities Plan Update Review – Western Plan of Study, Chester-Ridley Creek Service Area

Dear Mr. Pickett:

I am writing in response to your request for review comments on the plan noted above. The Aston Township Planning Commission has no comments on the plan update, and recommends its approval by the Aston Township Board of Commissioners.

I trust that this letter will help to satisfy the requirements of the Act with regard to municipal planning commission review.

Very truly yours,

Joseph McColgan

Joseph McColgan, Chairman
Aston Township Planning Commission

Memo

To:	Eileen Mulvena, PE Walton, Mulvena & Associates	From:	Gerard J. Fernandes, PE Stantec Consulting
File:	176710204	Date:	September 21, 2011

Reference: BROOKHAVEN BOROUGH – ACT 537 PLAN UPDATE

These are the responses to your September 20th email attachment containing additional comments and Questions.

1. SWDCMA will be exploring all available options for funding and the timing is targeted in 2012.
2. DELCORA will be the borrower for the construction of the new pump station
3. Confirmed that debt service in Table 3 reflects the total debt currently held by SWDCMA.
4. Comment noted. No response required.
5. 60/40 split between MTSA/SWDCMA is our best estimate at this time of the anticipated flow requirements of the future. This is based on the available opportunity for growth in the two Townships. The tri-party agreement for this split has not yet been finalized.
6. All pump stations are operational and have been maintained by SWDCMA to minimize replacement cost. The cost of this maintenance is historically drawn from the operating budget.
7. Existing Chester Township customers are included in the customer base in our analysis.
8. Loan interests of 5% used for debt service and escalation & present worth rate used is 3%.
9. Attached sheet shows the table with 3.5 million dollars borrowed in 2012 to cover shortfall. The debt service for this is included and this shows that the Authority will not be in a budget deficit except for a little in 2024 that can easily be covered with the previous years' revenue.
10. No specific cost of service study performed beyond what has been provided to you already.

STANTEC CONSULTING SERVICES INC.

Gerard J. Fernandes, PE, C.Eng
Senior Associate
gerard.fernandes@stantec.com

Attachment:

c. SWDCMA Board, DELCORA, PADEP

DELAWARE COUNTY REGIONAL WATER QUALITY CONTROL AUTHORITY
P.O. Box 999 • Chester, PA 19016-0999

May 23, 2011

Mr. John Wilwert, Jr.
Council President
Brookhaven Borough
2 Cambridge Road, Suite 100
Brookhaven, PA 19015-1708

RE: Western Delaware County Act 537
Sewage Facilities Plan Update,
Chester-Ridley Creek Service
Area, April 15, 2011
(Revised Draft)

Dear Mr. Wilwert:

DELCORA is in receipt of your comments dated May 12, 2011 regarding the Chester-Ridley Creek 537 Plan. Please find enclosed the response to comments which were addressed in the update, submitted to the PADEP.

Thank you for your attention.

Sincerely,

Joseph L. Salvucci
Executive Director

JLS:vm
enclosure

cc: Elizabeth Mahoney, P.E., DEP
Nelson Shaffer, Chairman, SWDCMA
John E. Pickett, AICP, Director, Delaware County Planning Department
Beth Bolt, Weston
Christine Volkay-Hilditch
File

RESPONSE TO COMMENTS FROM BROOKHAVEN BOROUGH dated 12 May 2011

Response Date 17 May 2011

Page 1 of the Brookhaven comments to the Western Delaware County Act 537 Sewage Facilities Plan Update Chester Ridley Creek Service Area (Revised 15 April 2011) contains background of the Act 537 plan development except the publication date should be 15 April 2011 in the last paragraph, and the revised plan advertisement was not submitted to PADEP.

Response to Comments:

Comment 1: This is a statement; there is no impact on the document under review.

Comment 2: It is premature to state that PADEP may not approve the plan revision until Brookhaven Borough revises its official plan. PADEP may approve the plan. By not accepting support from the DPCD and DELCORA in the form of Act 537 planning, Brookhaven Borough is responsible for revising its own Act 537 Plan. The 620 users that are currently serviced by SWDCMA will continue to be serviced by SWDCMA. SWDCMA has entered into an agreement with DELCORA to provide sewage treatment. SWDCMA entered this agreement to provide a higher degree of sewage treatment more economically than it could by continuing to operate the Baldwin Run Pollution Control Plant (BRPCP). These facts will need to be included in Brookhaven's revised Act 537 planning.

Comment 3: This is a statement. Cost estimates for construction and financing were provided in the plan. Ongoing administration, and operation and maintenance of the collection system remain constant across all scenarios. Operation and maintenance costs for the BRPCP were reported in the plan. Cost estimates reported in the plan clearly show that construction of the pump station and force main is more economical than continuing to operate the BRPCP. In addition, diversion of flow to the WRTP will provide a higher degree of wastewater treatment.

Comment 4: The costs for each alternative were estimated to the highest degree of accuracy possible at this time. The disparity in estimates ($35M to upgrade and continue to operate the BRPCP vs. $12M to construct the pump station and force main) provides a clear indication of the most economical sewage treatment alternative for SWDCMA customers.

Comment 5: The DCPD and DELCORA respectfully disagree with this comment. Estimates were prepared by WESTON and addressed in the Plan.

Comment 6: The DCPD and DELCORA respectfully disagree with this comment. SWDCMA ratepayers will not experience any interruption in sewage treatment services. SWDCMA has entered into agreement with DELCORA to provide rate stability, and is acting in the best interest of its customers, including residents of Brookhaven Borough.

Comment 7: This is a statement, no impact on document under review.

Comment 8: This is a statement. These questions have been asked and answered.

Comment 9: This is a statement, no impact on document under review.

Comment 10: This comment will be addressed by PADEP.

Comment 11: This is a statement, no impact on document under review.

Comment 12a: The project will be designed to avoid utility conflicts.

Comment 12b: The units for the force main should be linear feet. DELCORA has installed force mains through congested areas and is comfortable with the cost estimate for this effort. Route 291 includes factors other than utility conflicts, such as restoration of a state route and greater impacts to traffic that add to expense.

Comment 12c: There will be no permanent impacts to wetlands that would require mitigation. Permits may be necessary for temporary impacts.

Comment 12d: The cost of easements has been accounted for in the 15% contingency.

Comment 13: Costs for maintaining and operating the collection system will remain the same for all alternatives. This plan evaluates the variable portion of the user fee, which is the capital cost and financing for the alternatives presented in the plan.

Comment 14: PADEP has stated that nutrient limits will trump the need to develop TMDLs. Whether lower effluent limits for Nitrogen and Phosphorus are mandated by a TMDL or the EPA-proposed nutrient reduction goals, the treatment processes at the BRPCP will need to be upgraded. Costs for upgrading the BRPCP to tertiary treatment have been included in the Plan.

Comment 15: Statement, no impact to document under review.

Comment 16: Statement, no details were provided. $7M + $9M = $16M, which is greater than the $12M estimate for Alternative 2c.

Comment 17: This comment is not relevant to the Plan under review. The SWDCMA has decided to close its treatment plant and the flow will be treated by DELCORA. The municipalities that are part of the planning area with the exception of Brookhaven Borough have all adopted the plan. The statements regarding Chester Township appear to support Brookhaven residents approving the plan so they aren't part of the dwindling pool of ratepayers supporting operation of the BRPCP.

Comment 18: Table 6-1 in the plan provides an itemized cost estimate for upgrading the BRPCP to tertiary treatment (nitrogen removal). A statement appears on p. 6-6 that operation and maintenance costs for the BRPCP through 2019 have been estimated at $9M.

Comment 19: This comment was addressed at the Brookhaven Borough workshop meeting held on March 28, 2011. DELCORA reported that there is adequate capacity at the WRTP for flow from the SWDCMA. Planning for the Eastern Service Area will start later this year and treatment options have yet to be evaluated. The long-term planning horizon is unknown at this time. For example, if industrial flows continue to decrease, capacity at the existing rating of the WRTP will be available for additional flow from the Eastern Service Area.

DELAWARE COUNTY PLANNING DEPARTMENT

COURT HOUSE/GOVERNMENT CENTER
201 W. Front St. Media, PA 19063

Office Location: Toal Building, 2nd & Orange Sts., Media, PA 19063
Phone: (610) 891-5200 FAX: (610) 891-5203
E-mail: planning_department@co.delaware.pa.us

JOHN E. PICKETT, AICP
DIRECTOR

June 27, 2011

Mr. John Pickett, AICP
Director
Delaware County Planning Dept.
Court House and Government Center Bldg.
201 West Front Street
Media, PA 19063

Re: Act 537 Plan Update – Western Delaware County, Chester-Ridley Creek Service Area

Dear Mr. Pickett:

The Delaware County Planning Department (DCPD) staff has completed a review of the Western Delaware County Act 537 Plan Update for the Chester-Ridley Creek Service Area, prepared by Weston Solutions, Inc. for DCPD and the Delaware County Regional Water Quality Control Authority (DELCORA). The purpose of this plan update was to evaluate options for the long-term treatment of sewage flows generated in the Chester-Ridley Creek Service Area. The recommended alternative is to discontinue operation of the Baldwin Run Plant, and to construct a pump station and force main to direct sewage flows to DELCORA's Western Regional Treatment Plant located in the City of Chester via Force Main Alternative 2C (as identified in the Plan.).

DCPD has participated in the preparation of this plan update and supports its implementation. We also trust that all actions taken in support of its implementation will be undertaken in compliance with local, state, and federal laws and regulations. If you have any questions, please do not hesitate to contact me at 610-891-5214.

Very truly yours,

Steven R. Beckley, AICP
Senior Planner

Cc: Karen Holm, DCPD
Joseph Salvucci, DELCORA

Appendix F
Proof of Publication

Copy of Notice or Publication

The Delaware County Planning Department and the Delaware County Regional Water Quality Control Authority (DELCORA) have prepared an update to the Act 537 Sewage Facilities Plan addressing Sewage Facilities needs for the Chester-Ridley Creek Service Area which includes Aston Township, Middletown Township, and portions of Edgmont, Chester, Upper Chichester, and Upper Providence Townships, and Chester Heights and Brookhaven Boroughs. The City of Chester is the location to the Western Regional Treatment Plant (WRTP).

The following recommendation is included in the plan update:

1. Replace the existing Baldwin Run Water Pollution Control Plant with a pump station and force main to send wastewater from the service area to DELCORA's WRTP in the City of Chester.

The Plan Update Report is available for review at DELCORA's office at 100 East Fifth Street, Chester, PA 19016 (610-876-5523). DELCORA's office is open Monday through Friday from 8:30 to 4:30. Written comments on this plan should be directed to the individual municipalities and received within 30 days of this notification. A copy of the written comments should also be directed to DELCORA at the above address.

Proof of Publication of Notice in Delaware County Daily Times

Under Newspaper Advertising Act. No. 587, Approved May 16, 1929

State of Pennsylvania, }
County of Delaware, } ss.

Maureen A. Hartney

designated agent of CENTRAL STATES PUBLISHING, INC., being duly sworn, deposes and says that the DELAWARE COUNTY DAILY TIMES, a daily newspaper of general circulation as defined in the above-mentioned Act, published at Primos, Delaware County, Pennsylvania, was established September 7, 1876, and issued and published continuously thereafter for a period of 100 years and for a period of more than six months immediately prior hereto, (under the name Chester Times prior to November 2, 1959) in the City of Chester, County of Delaware and further says that the printed notice or publication attached hereto is an exact copy of a notice or publication printed and published in the regular edition and issues of the DELAWARE COUNTY DAILY TIMES on the following dates, viz.....

January 31, 2011
..... A.D. 20.....

and that said advertising was inserted in all respects as ordered.

Affiant further deposes that he is the proper person duly authorized by CENTRAL STATES PUBLISHING, INC. publisher of said DELAWARE COUNTY DAILY TIMES, a newspaper of general circulation, to verify the foregoing statement under oath and that affiant is not interested in the subject matter of the aforesaid notice or advertisement, and that all allegations in the foregoing statements as to time, place and character of publication are true.

Maureen A. Hartney

Sworn to and subscribed before me this

31st day of January 2011 20.....

Kathleen Ragni

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Kathleen Ragni, Notary Public
Upper Darby Twp., Delaware County
My Commission Expires March 2, 2011
Member, Pennsylvania Association of Notaries

cc: Act 537 Chester/Ridley CREEK

Copy of Notice or Publication

The Delaware County Planning Department and the Delaware County Regional Water Quality Control Authority (DELCORA) have prepared an update to the Act 537 Sewage Facilities Plan addressing Sewage Facilities needs for the Chester-Ridley Creek Service Area which includes Aston Township, Middletown Township, and portions of Edgmont, Chester, Upper Chichester, and Upper Providence Townships, and Chester Heights Borough. The City of Chester is the location of the Western Regional Treatment Plant (WRTP).

The following recommendation is included in the plan update:

1. Replace the existing Baldwin Run Water Pollution Control Plant with a pump station and force main to send wastewater from the service area to DELCORA's WRTP in the City of Chester.

The Plan Update Report is available for review at DELCORA's office at 100 East Fifth Street, Chester, PA 19013 (610-876-5523). DELCORA's office is open Monday through Friday from 8:30 AM to 4:30 PM. Written comments on this plan should be directed to the individual municipalities and received within 30 days of this notification. A copy of the written comments should also be directed to DELCORA at the above address.

Proof of Publication of Notice in Delaware County Daily Times

Under Newspaper Advertising Act. No. 587, Approved May 16, 1929

State of Pennsylvania, County of Delaware, } ss.

APR 2 - 2011

2011-0473

Maureen A. Hartney

designated agent of CENTRAL STATES PUBLISHING, INC., being duly sworn, deposes and says that the DELAWARE COUNTY DAILY TIMES, a daily newspaper of general circulation as defined in the above-mentioned Act, published at Primos, Delaware County, Pennsylvania, was established September 7, 1876, and issued and published continuously thereafter for a period of 100 years and for a period of more than six months immediately prior hereto, (under the name Chester Times prior to November 2, 1959) in the City of Chester, County of Delaware and further says that the printed notice or publication attached hereto is an exact copy of a notice or publication printed and published in the regular edition and issues of the DELAWARE COUNTY DAILY TIMES on the following dates, viz.....

April 14, 2011

A.D. 20.....

and that said advertising was inserted in all respects as ordered.

Affiant further deposes that he is the proper person duly authorized by CENTRAL STATES PUBLISHING, INC. publisher of said DELAWARE COUNTY DAILY TIMES, a newspaper of general circulation, to verify the foregoing statement under oath and that affiant is not interested in the subject matter of the aforesaid notice or advertisement, and that all allegations in the foregoing statements as to time, place and character of publication are true.

Maureen A. Hartney

Sworn to and subscribed before me this

15th day of April 2011

20.....

Kathleen Ragni

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Kathleen Ragni, Notary Public
Upper Darby Twp., Delaware County
My Commission Expires March 2, 2015
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

DELAWARE COUNTY **DAILY TIMES**

P.O. BOX 347, PRIMOS, PA 19018-0347
(610) 622-8800

LEGAL ADVERTISING

INVOICE NO. 382806

ACCT # 602998

CLASSIFICATION
610-876-5523 086

DELCO REGIONAL WATER QUAL
100 E. FIFTH STREET
P.O. BOX 999
CHESTER, PA 19016-0999

ITX AD# 2625984

RECEIVED
APR 21 2011
2011-0473

Return Yellow Copy with Payment

PAYMENT DUE UPON RECEIPT OF INVOICE

INVOICE DATE 4/14/11

DATE START	DATE STOP	DESCRIPTION	LINES	TIMES	TOTAL LINES	RATE	AMOUNT
4/14/11	4/14/11	THE DELAWARE COUNTY PLANN MXH WATER Plan update	55	1	55	TLEG	136.40
SKIP INSERTIONS DELCO REGIONAL							
DCT		EMAIL BARBARA NESCIO					
P.O. NO.		FIRST NOTICE				PROOF CHARGES	8.00
						PREPAID AMOUNT	
						TOTAL AMOUNT DUE	144.40

Copy of Notice or Publication

The Delaware County Planning Department and the Delaware County Regional Water Quality Control Authority (DELCORA) have prepared an update to the Act 537 Sewage Facilities Plan addressing Sewage Facilities needs for the Chester-Ridley Creek Service Area which includes Aston Township, Middletown Township, and portions of Edgmont, Chester, Upper Chichester, and Upper Providence Townships, Chester Heights and Brookhaven Borough. The City of Chester is the location of the Western Regional Treatment Plant (WRTP).

The following alternatives were evaluated for sewage treatment within the Chester-Ridley Creek Service Area:

1. Upgrade and continue operation of the existing Baldwin Run Pollution Control Plant
2. Replace the existing Baldwin Run Water Pollution Control Plant with a pump station and force main to send wastewater from the service area to DELCORA's WRTP in the City of Chester. Three different alignments for the force main from the Baldwin Run Pollution Control Plant in Aston Township to the Western Regional Treatment Plant located on the Delaware River at Booth Street were considered.

Alternative 2 was found to be the least expensive and the most environmentally beneficial alternative. The force main alignment requiring the least pumping capacity and the fewest conflicts with major roadways is the recommended alternative in the Act 537 Plan Update.

The Plan Update Report is available for review at DELCORA's office at 100 East Fifth Street, Chester, PA 19013 (610-876-5523). DELCORA's office is open Monday through Friday from 8:30 AM to 4:30 PM. Written comments on this plan should be directed to the individual municipalities and received within 30 days of this notification. A copy of the written comments should also be directed to DELCORA at the above address.

Proof of Publication of Notice in Delaware County Daily Times

Under Newspaper Advertising Act. No. 587, Approved May 16, 1929

AP/BAB

State of Pennsylvania, County of Delaware, } ss.

AUG 15 2011

2011-0913

Lynn D. Bettcher

designated agent of CENTRAL STATES PUBLISHING, INC., being duly sworn, deposes and says that the DELAWARE COUNTY DAILY TIMES, a daily newspaper of general circulation as defined in the above-mentioned Act, published at Primos, Delaware County, Pennsylvania, was established September 7, 1876, and issued and published continuously thereafter for a period of 100 years and for a period of more than six months immediately prior hereto, (under the name Chester Times prior to November 2, 1959) in the City of Chester, County of Delaware and further says that the printed notice or publication attached hereto is an exact copy of a notice or publication printed and published in the regular edition and issues of the DELAWARE COUNTY DAILY TIMES on the following dates, viz.....

August 6, 2011

A.D. 20.....

and that said advertising was inserted in all respects as ordered.

Affiant further deposes that he is the proper person duly authorized by CENTRAL STATES PUBLISHING, INC. publisher of said DELAWARE COUNTY DAILY TIMES, a newspaper of general circulation, to verify the foregoing statement under oath and that affiant is not interested in the subject matter of the aforesaid notice or advertisement, and that all allegations in the foregoing statements as to time, place and character of publication are true.

Lynn D. Bettcher

Sworn to and subscribed before me this

9th day of August 2011 20.....

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Kathleen Regni, Notary Public
Upper Darby Twp., Delaware County
My Commission Expires March 2, 2015
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

Appendix G
DELCORA SWDCMA Agreement of Service

DELCORA-SOUTHWEST DELAWARE COUNTY MUNICIPAL AUTHORITY AGREEMENT
AGREEMENT OF SERVICE

THIS AGREEMENT is made as of the **21st** day of **December 2009**, between the SOUTHWEST DELAWARE COUNTY MUNICIPAL AUTHORITY ("SOUTHWEST"), a Pennsylvania Municipal Authority, and DELAWARE COUNTY REGIONAL WATER QUALITY CONTROL AUTHORITY ("DELCORA"), a Pennsylvania Municipal Authority.

RECITALS

WHEREAS, By Order of the Pennsylvania Department of Environmental Protection ("DEP"), a regional wastewater system has been constructed and is operated by DELCORA to provide proper conveyance and treatment for wastewaters generated in portions of Delaware County.

WHEREAS, SOUTHWEST owns and operates a wastewater collection system and treatment facility servicing portions of Aston Township, Brookhaven Borough, Upper Providence Township, Bethel Township, Upper Chichester Township, Chester Township and Middletown Township.

WHEREAS, SOUTHWEST pursuant to a sewage treatment agreement with Middletown Delaware County Sewer Authority (MIDDLETOWN) dated the10th of January, 1968, as amended has agreed to receive and treat sewage generated in certain portions of Middletown Township.

WHEREAS, SOUTHWEST desires to cease to treat wastewater and instead to divert flows from Aston Township, Brookhaven Borough, Upper Providence Township, Bethel Township and Upper Chichester Township to DELCORA's Western Regional Treatment Plant in the City of Chester (The WRTP) or other facilities in the DELCORA System.

WHEREAS, SOUTHWEST desires to terminate its obligations to receive and treat sewage generated in Middletown Township pursuant to its agreement with MIDDLETOWN upon the connection and transmission of sewage to DELCORA as provided for in this Agreement.

WHEREAS, DELCORA will design and construct a Pump Station with metering and a force main ("The System"), which will convey certain wastewater from SOUTHWEST's treatment plant to DELCORA, DELCORA will then operate and maintain "The System" in accordance with the provisions set forth in this Agreement.

WHEREAS, the wastewater received from SOUTHWEST pursuant to this Agreement will be conveyed to DELCORA for treatment via "The System".

WHEREAS, this Agreement is in addition to and does not supersede or replace any other earlier agreements between SOUTHWEST, its member municipalities, for treatment of wastewater except for the Agreement with respect to treatment of Middletown and Chester Township as set forth in this Agreement].

NOW, THEREFORE, with the foregoing recitals made a part hereof and incorporated herein, the parties hereto, intending to be legally bound, hereby covenant and agree as follows:

Executed in 4 counterparts

ARTICLE I

CONSTRUCTION OF THE SYSTEM

1.01 Construction and Design Capacity. DELCORA will be responsible for design and construction of "The System" and will use its best efforts to have "The System" on line and operational as soon as practical. "The System" shall be designed at a minimum to provide capacity sufficient to meet SOUTHWEST's present and future requirements projected in any amendment to SOUTHWEST's Act 537 Plan made incident to the diversion of wastewater to DELCORA for treatment. SOUTHWEST reserves the right to review the design and specifications of "The System."

1.02 SOUTHWEST shall provide to DELCORA the necessary easement to construct the Pump Station on property now owned or leased by SOUTHWEST. DELCORA shall be responsible to obtain all other necessary easements for "The System."

ARTICLE II

CONDITIONS PRECEDENT TO THIS AGREEMENT

2.01 The obligations contained in this Agreement are conditioned upon the following:

a. MIDDLETOWN and DELCORA enter into an Agreement by which DELCORA agrees to receive and treat all sewage flows from MIDDLETOWN which are now received and treated by SOUTHWEST and MIDDLETOWN agrees with DELCORA to separate metered flows, separate billing and separate rates to be imposed by DELCORA and paid by MIDDLETOWN.

b. MIDDLETOWN agrees to terminate its Agreement dated January 10, 1968, as amended, with SOUTHWEST by which MIDDLETOWN releases and forever discharges SOUTHWEST from all claims, costs, causes of action which said MIDDLETOWN has, now has, or will have in the future, and, further providing for said Agreement dated January 10, 1968 as amended to be null and void.

c. MIDDLETOWN agrees to pay its proportionate share of the costs of "The System".

d. MIDDLETOWN and SOUTHWEST enter into agreements respecting easements and other relevant issues.

e. All flows emanating from Chester Township and currently being treated by SOUTHWEST will become direct customers of DELCORA, as long as the diversion is determined by DELCORA'S engineer to be feasible.

f. DELCORA obtains necessary governmental approvals for the construction and operation of "The System", including necessary 537 Plans and Chapter 94 Approvals.

g. Initial diversion must occur on or before December 31, 2014.

Executed in 4 counterparts

ARTICLE III

DELIVERY AND ACCEPTANCE OF WASTEWATER

3.01. Point of Connection. Acceptance of Wastewater. The wastewater covered by this Agreement will be delivered by SOUTHWEST to DELCORA at a point of connection at the Pump Station to be constructed by DELCORA located at the SOUTHWEST's Treatment Plant site. A Metering Station, to be owned by DELCORA, will be constructed in the Pump Station as part of the SOUTHWEST System which will measure and record all flows from SOUTHWEST to DELCORA.

3.02 Acceptance of Wastewater: Subject to the availability of capacity for treatment, DELCORA agrees to accept those discharges which are in compliance with the DELCORA Standards, Rules & Regulations from the SOUTHWEST tributary and conveyance facilities.

ARTICLE IV

SERVICE CHARGES AND PAYMENTS

4.01 Construction Costs/Debt Service. SOUTHWEST will pay costs associated with the design and construction of the infrastructure needed to convey the flow to the WRTP amortized over a period to twenty (20) years, however, SOUTHWEST will only be responsible for the costs (principal and interest) based on SOUTHWEST's percentage of flow to the WRTP in relation to the total flow of The Pump Station which percentage will be calculated annually; provided, however, that should SOUTHWEST divert any portion of its flow to any other facility while any debt, or the refinancing of any debt, for "The System" remains outstanding, SOUTHWEST will remain liable for its share of such debt in the proportion that existed immediately prior to such diversion.

4.02 Service Charge. SOUTHWEST agrees to pay DELCORA in each calendar year or portion thereof during which this Agreement is in effect, subject to the other provisions hereof, a service charge for the wastewater treatment and transportation services rendered by DELCORA to SOUTHWEST for wastewater emanating from SOUTHWEST. The service charge shall be based upon rates which are uniform for DELCORA's wholesale users. Costs may include pro rata shares of administrative and general expenses, costs of effective and reasonable operation, maintenance, repair, renewal, and replacement, ordinary improvements, costs of construction, costs of operating and maintaining flow monitoring and sampling equipment, all amounts required to carry and amortize temporary and bonded indebtedness including required payments to reserve funds, and reasonable reserves.

Service charges for any industrial users in SOUTHWEST member municipalities served by this Agreement who are required to obtain an industrial discharge permit shall be shown separately on each invoice, charges for such industries shall include a volume charge (based upon wastewater flow or water consumption as deemed appropriate by DELCORA) and any applicable surcharges for high strength flows. Such rates and surcharges shall be equitable and consistent with rates and surcharges established for industrial users in other parts of the Western Service Area. Charges for industrial users will be reconciled at year end based on actual flows and loadings.

4.03. Estimate of Service Charges. On or before December 1st of each year commencing in the year of initial diversion, DELCORA will prepare and submit to SOUTHWEST a statement approved by the DELCORA's Board of Directors showing, in reasonable detail, for the next succeeding calendar year: (1) the estimated amounts to be paid by SOUTHWEST during such year as its estimated service charge determined in accordance with the provisions hereof; (2) the amount, if any, to be credited against the estimated service charge for such years as the result of any overpayments or adjustments of payments for any preceding year, as provided under Section 4.07 below; and (3) the amount of any prior bill not paid pursuant to Section 4.02 plus 6% interest pursuant to Section 4.02. On or before November 1st of each year following the Initial Conveyance, DELCORA will prepare and submit to SOUTHWEST preliminary Estimated Service Charged.

4.04 Amended Estimates. In the event of unusual contingencies requiring an upward revision in the current budget adopted by DELCORA, or in the event of a material change in the quantity or quality of SOUTHWEST wastewater flow, DELCORA may amend the estimated service charges to reflect such changed conditions. A statement showing the amended estimated payments, in reasonable detail, and the reasons therefore shall be submitted to SOUTHWEST thereafter, commencing with the next quarterly payment the payments made by SOUTHWEST shall be based upon the amended estimate. In the event SOUTHWEST is not able legally to obtain funds with which to pay all of its share of the increase, any unpaid amount shall be paid by it in the calendar year following the receipt of the notice of the amended service charge. Interest on the increase resulting from the amended service charge shall be applied at the rate of 6% A.P.R. to the portion of the increase remaining to be paid as of March 1 of the said calendar year following the year in which the notice of the increase was received.

4.05 Payments on Estimates. SOUTHWEST agrees to pay its Estimated Service Charges for such next succeeding calendar year in four (4) equal installments to be paid on or before March 1, June 1 September 1, and December 1 of each year. Actual usage of DELCORA's sewer system will be reconciled with the estimates utilized in calculating quarterly billings and adjustments made pursuant to 4.06 below.

4.06 Audited Statements. DELCORA shall cause to be prepared and certified by an Independent Public Accountant on or before April 30th of each year a report setting forth in reasonable (a) the Operating and Capital Costs of the Western Regional System for the preceding calendar year, and (b) the final service charge chargeable to SOUTHWEST for such year determined in accordance with the provisions of Sections 4.02 through 4.05 above. Such report shall contain statements setting for the payments theretofore made by SOUTHWEST for such year as determined in accordance with the provisions of Sections 4.02 through 4.05 above. Such report shall contain statements setting forth the payments theretofore made by or allowed to SOUTHWEST on account of such service charge.

4.07 Payment to Final Service Charges; Credit for Overpayments. If the Final Service Charge to SOUTHWEST for any calendar year as shown by such certified report differs from the aggregate of the payments and credits theretofore made by it based upon the aforesaid estimates, then SOUTHWEST will pay to DELCORA the amount of the any deficiency within thirty (30) days after delivery of said certified

report, and any excess of such payments and credits on account of estimates over the Final Service Charges shall be refunded to SOUTHWEST within thirty (30) days.

4.08 Interest on Late Payments. If SOUTHWEST does not make full payment of any such quarterly installments or additional charges, except as specified in Section 4.04, on or before the specified payment date, there shall be added to the amount thereof interest at the rate of 6 % from the due date of such charge to the date on which DELCORA shall receive payment thereof.

4.09 State and Federal Regulations to be Followed. Notwithstanding any provision set forth in this Article, the service charges payable to DELCORA under this Agreement shall be calculated in such manner as will comply with the applicable regulations of the Federal Environmental Protection Agency and the Pennsylvania Department of Environmental Protection, or any successor agencies having jurisdiction thereof.

4.10 Tapping Fees. DELCORA will not charge a tapping fee in connection with the initial diversion of SOUTHWEST's wastewater to WRTP. DELCORA may institute a tapping fee applicable to SOUTHWEST's new connections on or after two (2) years from initial diversion of wastewater.

ARTICLE V

MEASURMENT OF WASTEWATER FLOWS

5.01 Installation of Meters. The quantity of wastewater emanating from SOUTHWEST's facilities and discharged into "The System" shall be based upon readings of the meter at the metering station in the Pump Station as referenced in Section 3.01 above.

5.02 Meter Readings, Maintenance and Calibration. DELCORA will maintain a daily record of the wastewater flowing through the aforesaid meter. DELCORA will maintain, or cause to be maintained, as part of the annual costs the aforesaid meter and cause it to be inspected and calibrated at least quarterly for accuracy by the manufacturer thereof or some other company or person qualified to make such inspections.

5.03 Access to Meter. SOUTHWEST shall have the right of access to the meter and all meter records for the purpose of reading and checking for accuracy, at its expense.

5.04 Missing or Inaccurate Flow Records. In the case of missing or inaccurate flow records due to faulty meter operation or otherwise, an estimate of flows shall be made by DELCORA based on records of past flow or similar flows as applied to the current conditions, for use in place of meter readings.

ARTICLE VI

WASTEWATER QUALITY RESTRICTIONS

6.01 Standards, Rules and Regulations. DELCORA has adopted uniform wastewater quality standards known as the DELCORA Standards, Rules and Regulations, which comply with the requirements of Federal, State and Local regulatory authorities. SOUTHWEST and its member municipalities will refrain from discharging or permitting the discharge of wastewater from the SOUTHWEST 's facilities into DELCORA's System that would violate any of such standards as they now exist or as they may be

modified from time to time. Wastewater which does not meet the standards set forth in the DELCORA standards, Rules and Regulations is hereinafter referred to as "improper wastewater" or "improper discharge".

6.02 Compelling Compliance by Users; Penalties; Enforcement.

a. SOUTHWEST and its member municipalities, if they have not already done so, shall adopt an ordinance or suitable regulation which, at a minimum, offers equivalency with DELCORA's Standards, Rules & Regulations, as amended, prior to the acceptance of any discharge by DELCORA. Further, SOUTHWEST and its member municipalities agree to adopt an ordinance or suitable regulations which, at a minimum, offers equivalency with any amendment to, revisions of, or substitution of DELCORA's Standards, Rules & Regulations, within 60 days of notice of the passage of said amendment, revision or substitute resolution.

b. SOUTHWEST and its member municipalities, if they have not already done so, shall adopt an ordinance setting criminal and civil penalties for violations of DELCORA's Standards, Rules & Regulations which shall be applicable to all discharges into SOUTHWEST's tributary and conveyance facilities and which are at least as high as the minimum penalties established by EPA's Pretreatment Regulations.

c. SOUTHWEST and its member municipalities shall cooperate with DELCORA in enforcing the DELCORA Standards, Rules & Regulations, shall help identify industrial users located within their boundaries, and shall delegate their enforcement authority to DELCORA to the extent allowed by law.

6.03 Permits for Industrial Connections. SOUTHWEST expressly acknowledges that any and all industrial users discharging to the SOUTHWEST tributary and conveyance facilities must have a permit issued by DELCORA prior to acceptance by DELCORA of the discharge from the industrial user. SOUTHWEST and its member municipalities shall identify each industrial user now discharging or hereafter desiring to discharge industrial waste into SOUTHWEST's collection system and shall require each such industrial user to apply to and receive from DELCORA a permit complying with DELCORA's Standards, Rules & Regulations, as hereafter supplemented or amended and SOUTHWEST and its member municipalities will prohibit any such discharge by any industrial user which has not received such a permit from DELCORA. Should DELCORA and SOUTHWEST agree, DELCORA will enforce the standards, rules and regulations and operate the pretreatment program for SOUTHWEST's customers and member municipalities, and the parties will cooperate to cause each customer and member municipality to take such action as may be necessary to give it authority to do so. Should DELCORA and SOUTHWEST not agree, SOUTHWEST will enforce the standards, rules and regulations and operate the pretreatment program for SOUTHWEST's customers and member municipalities, and the parties will cooperate to cause each customer and member municipality to take such action as may be necessary to give it authority to do so to insure the protection of the DELCORA WRTP in accordance with U.S. EPA regulations..

6.04 Reimbursement for Damages from Improper Discharge. SOUTHWEST and its member municipalities will assist DELCORA in determining the source of any improper wastewater. Upon notice from and at the direction of DELCORA, SOUTHWEST and its member municipalities will assist DELCORA in terminating the flow of any improper discharge. DELCORA shall be SOUTHWEST's and its member municipalities' agent in prosecuting and/or initiating civil action against the person or entity which is the source of the improper discharge. All damages caused to DELCORA's and SOUTHWEST's property as the result of improper discharge shall be recoverable from the person or entity which is the source of improper discharge. If DELCORA is unable to recover its damages after pursuing a civil action against the source, the excess damages shall be recovered through the rate structure in succeeding years.

ARTICLE VII

OPERATION AND MAINTENANCE OF FACILITIES

7.01 DELCORA Facilities. After completion of the construction of the Pump Station and the Force Main, DELCORA will exercise best efforts to continuously operate, maintain and repair "The System" or cause it to be maintained and repaired so that it will be at all times in efficient operating condition and in compliance with the standards prescribed by all appropriate regulatory agencies for the purpose of this Agreement.

7.02 SOUTHWEST Facilities. SOUTHWEST and its member municipalities will continue to operate, maintain, and repair their sanitary sewer systems and any other sewage conveyance facilities so that they will at all times be in efficient operating condition and in compliance with the standards prescribed by all appropriate regulatory agencies.

7.03 Imposition of Sewer Rentals by SOUTHWEST. SOUTHWEST reserves and retains the right as an independent authority to maintain its facilities and bill its customers as provided by law and the Pennsylvania Municipality Authority Act.

7.04 Hold Harmless. DELCORA shall hold SOUTHWEST harmless for damages or losses to person or property of third parties directly resulting from DELCORA's maintenance or repair of "The System" pursuant to Section 7.01 hereof; provided however, that the hold harmless provisions of this Section 7.04 shall not apply with respect to maintenance and repairs to "The System" required as a result of (a) SOUTHWEST's breach of this Agreement; (b) SOUTHWEST's non-compliance with the DELCORA Standards, Rules and Regulations then in effect; (c) SOUTHWEST 's violation of federal state or local statutes, ordinances, regulations or procedures applicable wastewater transportation, treatment and/or disposal; and/or (d) illegal, intentional and/or negligent act(s) of SOUTHWEST or its member municipalities.

ARTICLE VIII

GOVERNMENTAL GRANTS AND SUBSIDIES; PERMITS

8.01 Applications. In its discretion, DELCORA may make proper and timely applications to the Commonwealth of Pennsylvania and to the United States of America and their appropriate agencies for

available grants, subsidies or other payments and for all permits and approvals in respect to the construction, acquisition, operation and maintenance of "The System."

8.02 Compliance with Conditions for Grants. Each party will take all such action, within its legal powers, as may be required to comply with applicable laws and regulations relating to Federal and State grants and subsidies, to the end that such grants and subsidies may be obtained for "The System" in the maximum amount, and each party will use its best efforts to obtain the similar compliance from users and others.

ARTICLE IX

MISCELLANEOUS

9.01 Insurance. DELCORA shall maintain the following types and amounts of insurance during the term of this Agreement. SOUTHWEST shall be named as an additional insured in the applicable liability insurance policies for claims arising out of DELCORA's negligence.

Type of Coverage	Minimum Limits
Worker's Compensation	Statutory
General Liability	$2,000,000
Excess General Liability	$5,000,000
Automobile Liability	$500,000
Excess Automobile Liability	$5,000,000
Pollution Control and Liability	$1,000,000

DELCORA will provide the SOUTHWEST with a certificate of insurance evidencing the required coverage upon SOUTHWEST's request.

9.02 Inspection. Each party shall provide each other from time to time all information relevant to the proper administration of their responsibilities under this Agreement, or in respect to the interpretation hereof, as, and in such form and detail as, may be reasonably requested and each shall at all reasonable times and from time to time permit their representatives to examine and inspect their respective records and physical facilities relevant to the subject matter of this Agreement.

9.03 Force Majeure. Notwithstanding any other provision of this Agreement neither party hereto shall be responsible in damages to the other for any failure to comply with this Agreement resulting from an act of God or riot, sabotage, public calamity, flood, strike, breakdown of conveyance or treatment facilities, or other even beyond its reasonable control.

9.04 Indemnity; Agency. To the extent permitted by the Political Subdivision Tort Claims Act, 42 C.S.A. Section 8541 et seq., each party agrees to indemnify, defend and save harmless the other party against all costs, claims, losses, damages or legal actions of any nature on account of any injury to persons or property occurring in the performance of this Agreement due to the negligence of such party or its agents, employees, contractors or subcontractors.

Executed in 4 counterparts

DELCORA agrees to indemnify, defend and save harmless SOUTHWEST from any costs, claims, losses, damages and legal actions of any nature arising from or in connection with the design, construction of "The System".

9.05 No Joint Ownership. No provision of this Agreement shall be construed to create any type of joint ownership of any property, any partnership or joint venture, or create any other rights of liabilities except as expressly set forth herein.

9.06 Severability. Should any provision hereof for any reason be held illegal or invalid, no provision of this Agreement shall be affected, and this Agreement shall then be construed and enforced as if such illegal or invalid provision had not been contained herein.

9.07 Headings. The headings in this Agreement are solely for convenience and shall have no effect in the legal interpretation of any provision thereof.

9.08 Effective Date and Term of Agreement. This Agreement shall become effective as of the date and year first written above and shall remain in force and effect for a period of twenty five (25) years from such date, (subject to appropriate extensions of the period of existence of DELCORA and of similar extensions of the other Service Agreements) and may be renewed by either party for an additional period of twenty five (25) years, subject to any limitation on the life of either party under the Municipality Authorities Act.

9.09 Waiver. The failure of a party hereto to insist upon strict performance of this Agreement or any of the terms or conditions hereof shall not be construed as a waiver of any of its rights hereunder.

9.10 Counterparts. This Agreement has been executed in counterparts, each of which shall be regarded for all purposes as an original, but such counterparts shall together constitute but one and the same instrument.

9.11 Successors and Assigns. Except as provided in Section 9.12 hereof, this Agreement may not be voluntarily assigned by either party without the consent of the other. Subject to the foregoing, this Agreement shall bind and inure to the benefit of the respective successors and assigns of the parties hereto.

9.12 Assignment of Service Charges. DELCORA may assign and/or pledge its rights to receive payments from SOUTHWEST incident to any financing, present or future.

ARTICLE X

DEFINITIONS

10.01 Defined Terms. Applicable terms not defined herein shall have the meanings given to them in DELCORA's Standards, Rules and Regulations as amended, except in those instances where the context clearly indicates otherwise.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the date and year first written above by their respective duly authorized officers and their respective seals to be hereunto affixed.

Executed in 4 counterparts

DELAWARE COUNTY REGIONAL
WATER QUALITY CONTROL AUTHORITY

(CORPORATE SEAL)

Attest: _____
Secretary

By: _____
Chairman

SOUTHWEST DELAWARE COUNTY
MUNICIPAL AUTHORITY

(CORPORATE SEAL)

Attest: _____
Secretary

By: _____
Chairman

Executed in 4 counterparts

PADEP Check List

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Instructions for Completing Act 537 Plan Content and Environmental Assessment Checklist

Remove and recycle these instructions prior to submission

CHECKLIST INSTRUCTIONS

These instructions are designed to assist the applicant in completing the Act 537 Plan Content and Environmental Assessment Checklist.

This checklist is composed of three parts: one for "General Information," one for "Administrative Completeness," and one for "General Plan Content". A plan must be "administratively complete" in order to be formally reviewed by DEP. The General Plan Content portion of the checklist identifies each of the issues that must be addressed in your Act 537 Plan Update based on the pre-planning meeting between you and/or your consultant and DEP.

Use the right-hand column blanks in the checklist to identify the page in the plan on which each planning issue is found or to reference a previously approved update or special study (title and page number).

If you determine a planning issue is not applicable even though it was previously thought to be needed, please explain your decision within the text of the plan (or as a footnote) and indicate the page number where this documentation is found.

When information required as part of an official plan update revision has been developed separately or in a previous update revision, incorporate the information by reference to the planning document and page.

For specific details covering the Act 537 planning requirements, refer to Chapters 71 and 73 of DEP's regulations.

Wastewater projects proposing funding through the following sources must prepare an "Environmental Report" as described in the Uniform Environmental Review Process (UER) and include it with the plan submission designated as "Plan-Appendix A". The following funding programs use the UER process.

- The Clean Water State Revolving Loan Fund (PENNVEST, DEP, EPA)
- The RUS Water and Waste Disposal Grant and Loan Program (USDA-RD)
- The Community Development Block Grant Program (DCED, HUG)
- Other Federal Funding Efforts (EPA)

The checklist items or portions of checklist items required in the Act 537 Plan Update revision and that are also included in the UER process are indicated by shading. Most of the "Environmental Report" document may be constructed from the Act 537 Official Plan Update revision by using "copy & paste" techniques. The technical guidance document *Uniform Environmental Review Process* (UER) (DEP ID. 381-5511-111) is available electronically on DEP's website at www.depweb.state.pa.us.

After Municipal Adoption by Resolution, submit three copies of the plan, any attachments or addenda and this checklist to DEP.

A copy of this completed checklist must be included with your Act 537 plan. DEP will use the "DEP USE ONLY" column during the completeness evaluation of the plan. This column may also be used by DEP during the pre-planning meeting with the municipality to identify planning elements that are not required to be included in the plan.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

Act 537 Plan Content and Environmental Assessment Checklist

PART 1 GENERAL INFORMATION

A. Project Information

1. Project Name Western Delaware County Act 537 Sewage Facilities Plan Update Chester-Ridley Creek Service Areat

2. Brief Project Description Act 537 Plan update including all municipalities within the Southwest Delaware County Municipal Authority (SWDCMA) service area to resolve existing problems at the Baldwin Run Pollution Control Plant (BRPCP) discharging to Chester Creek in Aston, Twp., Delaware County.

B. Client (Municipality) Information

Municipality Name	County	City	Boro	Twp
Delaware County Regional Water Quality Control Authority (DELCORA)	Delaware	☐	☐	☐

Municipality Contact Individual - Last Name	First Name	MI	Suffix	Title
Volkay-Hilditch	Christine		PE,DEE	Director of Engineering

Additional Individual Last Name	First Name	MI	Suffix	Title
Powell	Robert	A		Business Development Manager

Municipality Mailing Address Line 1	Mailing Address Line 2
100 East Fifth Street	P.O. Box 999

Address Last Line -- City	State	ZIP+4
Chester	PA	19016-0999

Phone + Ext.	FAX (optional)	Email (optional)
610-876-5523 X 116	610-827-2728	hilditchc@delcora.org

C. Site Information

Site (or Project) Name	(Municipal Name) Act 537 Plan
Delaware County Western Region	

Site Location Line 1	Site Location Line 2
Aston Twp., Chester Twp, Chester Heights Borough, Brookhaven Borough, and Chester City	Middletown, Edgmont, Upper Chichester, Upper Providence Twps.

D. Project Consultant Information

Last Name	First Name	MI	Suffix
Lehman	Roger	W	P.E.

Title	Consulting Firm Name
Technical Director	Weston Solutions, Inc.

Mailing Address Line 1	Mailing Address Line 2
Building 5-1	1400 Weston Way

Address Last Line – City	State	ZIP+4	Country
West Chester	PA	19380	USA

Email	Phone + Ext.	FAX
Roger.Lehman @ Westonsolutions.com	610 701 3708	610 701 3401

PART 2 ADMINISTRATIVE COMPLETENESS CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan	In addition to the main body of the plan, the plan must include items one through eight listed below to be accepted for formal review by the department. Incomplete Plans will be returned unless the municipality is clearly requesting an advisory review.
____	i	1. **Table of Contents**
		2. **Plan Summary**
_____	viii	A. Identify the proposed service areas and major problems evaluated in the plan. (Reference - Title 25, §71.21.a.7.i).
_____	viii	B. Identify the alternative(s) chosen to solve the problems and serve the areas of need identified in the plan. Also, include any institutional arrangements necessary to implement the chosen alternative(s). (Reference Title 25 §71.21.a.7.ii).
_____	vix	C. Present the estimated cost of implementing the proposed alternative (including the user fees) and the proposed funding method to be used. (Reference Title 25, §71.21.a.7.ii).
_____	vix	D. Identify the municipal commitments necessary to implement the Plan. (Reference Title 25, §71.21.a.7.iii).
_____	vix	E. Provide a schedule of implementation for the project that identifies the MAJOR milestones with dates necessary to accomplish the project to the point of operational status. (Reference Title 25, §71.21.a.7.iv).
_____	Appendix D	3. **Municipal Adoption: Original,** signed and sealed Resolution of Adoption by the municipality which contains, at a minimum, alternatives chosen and a commitment to implement the Plan in accordance with the implementation schedule. (Reference Title 25, §71.31.f) Section V.F. of the Planning Guide.
_____	Appendix E	4. **Planning Commission / County Health Department Comments**: Evidence that the municipality has requested, reviewed and considered comments by appropriate official planning agencies of the municipality, planning agencies of the county, planning agencies with area wide jurisdiction (where applicable), and any existing county or joint county departments of health. (Reference-Title 25, §71.31.b) Section V.E.1 of the Planning Guide.
_____	Appendix F	5. **Publication:** Proof of Public Notice which documents the proposed plan adoption, plan summary, and the establishment and conduct of a 30 day comment period. (Reference-Title 25, §71.31.c) Section V.E.2 of the Planning Guide.
_____	Appendix E	6. **Comments and Responses:** Copies of ALL written comments received and municipal response to EACH comment in relation to the proposed plan. (Reference-Title 25, §71.31.c) Section V.E.2 of the Planning Guide.
_____	9-1	7. **Implementation Schedule:** A complete project implementation schedule with milestone dates specific for each existing and future area of need. Other activities in the project implementation schedule should be indicated as occurring a finite number of days from a major milestone. (Reference-Title 25, §71.31.d) Section V.F. of the Planning Guide. Include dates for the future initiation of feasibility evaluations in the project's implementation schedule for areas proposing completion of sewage facilities for planning periods in excess of five years. (Reference Title 25, §71.21.c).
_____	Appendix E	8. **Consistency Documentation:** Documentation indicating that the appropriate agencies have received, reviewed and concurred with the method proposed to resolve identified inconsistencies within the proposed alternative and consistency requirements in 71.21.(a)(5)(i-iii). (Reference-Title 25, §71.31.e). Appendix B of the Planning Guide.

PART 3 GENERAL PLAN CONTENT CHECKLIST

DEP Use Only	Indicate Page #(s) in Plan		Item Required
_____	5-1	**I.**	**Previous Wastewater Planning**
		A.	Identify, describe and briefly analyze all past wastewater planning for its impact on the current planning effort:
_____	5-1	1.	Previously undertaken under the Sewage Facilities Act (Act 537). (Reference-Act 537, Section 5 §d.1).
_____	_____	2.	Has not been carried out according to an approved implementation schedule contained in the plans. (Reference-Title 25, §71.21.a.5.i.A-D). Section V.F of the Planning Guide.
_____	_____	3.	Is anticipated or planned by applicable sewer authorities or approved under a Chapter 94 Corrective Action Plan. (Reference-Title 25, §71.21.a.5.i.A&B). Section V.D. of the Planning Guide.
_____	_____	4.	Through planning modules for new land development, planning "exemptions" and addenda. (Reference-Title 25, §71.21.a.5.i.A).
_____	p. 1-2 through 1-7	**II.**	**Physical and Demographic Analysis utilizing written description and mapping** (All items listed below require maps, and all maps should show all current lots and structures and be of appropriate scale to clearly show significant information).
_____	p.1-3	A.	Identification of planning area(s), municipal boundaries, Sewer Authority/Management Agency service area boundaries. (Reference-Title 25, §71.21.a.1.i).
_____	N/A	B.	Identification of physical characteristics (streams, lakes, impoundments, natural conveyance, channels, drainage basins in the planning area). (Reference-Title 25, §71.21.a.1.ii).
_____	N/A	C.	Soils - Analysis with description by soil type and soils mapping for areas not presently served by sanitary sewer service. Show areas suitable for in-ground onlot systems, elevated sand mounds, individual residential spray irrigation systems, and areas unsuitable for soil dependent systems. (Reference-Title 25, §71.21.a.1.iii). Show Prime Agricultural Soils and any locally protected agricultural soils. (Reference-Title 25, §71.21.a.1.iii).
_____	N/A	D.	Geologic Features - (1) Identification through analysis, (2) mapping and (3) their relation to existing or potential nitrate-nitrogen pollution and drinking water sources. Include areas where existing nitrate-nitrogen levels are in excess of 5 mg/L. (Reference-Title 25, §71.21.a.1.iii).
_____	N/A	E.	Topography - Depict areas with slopes that are suitable for conventional systems; slopes that are suitable for elevated sand mounds and slopes that are unsuitable for onlot systems. (Reference-Title 25, §71.21.a.1.ii).
_____	N/A	F.	Potable Water Supplies - Identification through mapping, description and analysis. Include public water supply service areas and available public water supply capacity and aquifer yield for groundwater supplies. (Reference-Title 25 §71.21.a.1.vi). Section V.C. of the Planning Guide.

_____ p. 1-5 G. Wetlands-Identify wetlands as defined in Title 25, Chapter 105 by description, analysis and mapping. Include National Wetland Inventory mapping and potential wetland areas per USDA, SCS mapped hydric soils. Proposed collection, conveyance and treatment facilities and lines must be located and labeled, along with the identified wetlands, on the map. (Reference-Title 25, §71.21.a.1.v). Appendix B, Section II.I of the Planning Guide.

_____ 1-14 **III. Existing Sewage Facilities in the Planning Area - Identifying the Existing Needs**

A. Identify, map and describe municipal and non-municipal, individual and community sewerage systems in the planning area including:

_____ 3-5 1. Location, size and ownership of treatment facilities, main intercepting lines, pumping stations and force mains including their size, capacity, point of discharge. Also include the name of the receiving stream, drainage basin, and the facility's effluent discharge requirements. (Reference-Title 25, §71.21a.2.i.A).

_____ 3-5 & 3-6 2. A narrative and schematic diagram of the facility's basic treatment processes including the facility's NPDES permitted capacity, and the Clean Streams Law permit number. (Reference-Title 25, §71.21.a.2.i.A).

_____ 3-6 3. A description of problems with existing facilities (collection, conveyance and/or treatment), including existing or projected overload under Title 25, Chapter 94 (relating to municipal wasteload management) or violations of the NPDES permit, Clean Streams Law permit, or other permit, rule or regulation of DEP. (Reference-Title 25, §71.21.a.2.i.B).

_____ 3-6 4. Details of scheduled or in-progress upgrading or expansion of treatment facilities and the anticipated completion date of the improvements. Discuss any remaining reserve capacity and the policy concerning the allocation of reserve capacity. Also discuss the compatibility of the rate of growth to existing and proposed wastewater treatment facilities. (Reference-Title 25, §71.21.a.4.i & ii).

_____ 7-4 5. A detailed description of the municipality's operation and maintenance requirements for small flow treatment facility systems, including the status of past and present compliance with these requirements and any other requirements relating to sewage management programs. (Reference-Title 25, §71.21.a.2.i.C).

_____ N/A 6. Disposal areas, if other than stream discharge, and any applicable groundwater limitations. (Reference-Title 25, §71.21.a.4.i & ii).

_____ 4-2 B. Using DEP's publication titled *Sewage Disposal Needs Identification*, identify, map and describe areas that utilize individual and community onlot sewage disposal and, unpermitted collection and disposal systems ("wildcat" sewers, borehole disposal, etc.) and retaining tank systems in the planning area including:

_____ 4-3 to 4-4 1. The types of onlot systems in use. (Reference-Title 25, §71.21.a.2.ii.A).

_____ N/A 2. A sanitary survey complete with description, map and tabulation of documented and potential public health, pollution, and operational problems (including malfunctioning systems) with the systems, including violations of local ordinances, the Sewage Facilities Act, the Clean Stream Law or regulations promulgated thereunder. (Reference-Title 25, §71.21.a.2.ii.B).

_____ N/A 3. A comparison of the types of onlot sewage systems installed in an area with the types of systems which are appropriate for the area according to soil, geologic conditions, topographic limitations sewage flows, and Title 25 Chapter 73 (relating to standards for sewage disposal facilities). (Reference-Title 25, §71.21.a.2.ii.C).

_____ N/A 4. An individual water supply survey to identify possible contamination by malfunctioning onlot sewage disposal systems consistent with DEP's *Sewage Disposal Needs Identification* publication. (Reference-Title 25 §71.21.a.2.ii.B).

_____ N/A 5. Detailed description of operation and maintenance requirements of the municipality for individual and small volume community onlot systems, including the status of past and present compliance with these requirements and any other requirements relating to sewage management programs. (Reference-Title 25, §71.21.a.2.i.C).

_____ _____ C. Identify wastewater sludge and septage generation, transport and disposal methods. Include this information in the sewage facilities alternative analysis including:

_____ 3-1 1. Location of sources of wastewater sludge or septage (Septic tanks, holding tanks, wastewater treatment facilities). (Reference-Title 25 §71.71).

_____ 3-1 2. Quantities of the types of sludges or septage generated. (Reference-Title 25 §71.71).

_____ 3-5 3. Present disposal methods, locations, capacities and transportation methods. (Reference-Title 25 §71.71).

_____ 5-13 **IV. Future Growth and Land Development**

A. Identify and briefly summarize all municipal and county planning documents adopted pursuant to the Pennsylvania Municipalities Planning Code (Act 247) including:

_____ N/A 1. All land use plans and zoning maps that identify residential, commercial, industrial, agricultural, recreational and open space areas. (Reference-Title 25, §71.21.a.3.iv).

_____ 5-13 2. Zoning or subdivision regulations that establish lot sizes predicated on sewage disposal methods. (Reference – Title 25§71.21.a.3.iv).

_____ N/A 3. All limitations and plans related to floodplain and stormwater management and special protection (Ch. 93) areas. (Reference-Title 25 §71.21.a.3.iv) Appendix B, Section II.F of the Planning Guide.

B. Delineate and describe the following through map, text and analysis.

_____ 5-7 through 5-10 1. Areas with existing development or plotted subdivisions. Include the name, location, description, total number of EDU's in development, total number of EDU's currently developed and total number of EDU's remaining to be developed (include time schedule for EDU's remaining to be developed). (Reference-Title 25, §71.21.a.3.i).

_____ N/A 2. Land use designations established under the Pennsylvania Municipalities Planning Code (35 P.S. 10101-11202), including residential, commercial and industrial areas. (Reference-Title 25,§71.21.a.3.ii). Include a comparison of proposed land use as allowed by zoning and existing sewage facility planning. (Reference-Title 25, §71.21.a.3.iv).

_____ 5-23 3. Future growth areas with population and EDU projections for these areas using historical, current and future population figures and projections of the municipality. Discuss and evaluate discrepancies between local, county, state and federal projections as they relate to sewage facilities. (Reference-Title 25, §71.21.a.1.iv). (Reference-Title 25, §71.21.a.3.iii).

_____	N/A	4. Zoning, and/or subdivision regulations; local, county or regional comprehensive plans; and existing plans of any other agency relating to the development, use and protection of land and water resources with special attention to: (Reference-Title 25, §71.21.a.3.iv). --public ground/surface water supplies --recreational water use areas --groundwater recharge areas --industrial water use --wetlands
_____	5-5 through 5-23	5. Sewage planning necessary to provide adequate wastewater treatment for five and ten year future planning periods based on projected growth of existing and proposed wastewater collection and treatment facilities. (Reference-Title 25, §71.21.a.3.v).
_____	6-1	**V. Identify Alternatives to Provide New or Improved Wastewater Disposal Facilities**
		A. Conventional collection, conveyance, treatment and discharge alternatives including:
_____	6-1	1. The potential for regional wastewater treatment. (Reference-Title 25, §71.21.a.4).
_____	6-2	2. The potential for extension of existing municipal or non-municipal sewage facilities to areas in need of new or improved sewage facilities. (Reference-Title 25, §71.21.a.4.i).
_____	6 1	3. The potential for the continued use of existing municipal or non-municipal sewage facilities through one or more of the following: (Reference-Title 25, §71.21.a.4.ii).
_____	6-1	a. Repair. (Reference-Title 25, §71.21.a.4.ii.A).
_____	6-1	b. Upgrading. (Reference-Title 25, §71.21.a.4.ii.B).
_____	6-1	c. Reduction of hydraulic or organic loading to existing facilities. (Reference-Title 25, §71.71).
_____	6-2	d. Improved operation and maintenance. Reference-Title 25, §71.21.a.4.ii.C).
_____	8-1	e. Other applicable actions that will resolve or abate the identified problems. (Reference-Title 25, §71.21.a.4.ii.D).
_____	8-1	4. Repair or replacement of existing collection and conveyance system components. (Reference-Title 25, §71.21.a.4.ii.A).
_____	8-2	5. The need for construction of new community sewage systems including sewer systems and/or treatment facilities. (Reference-Title 25, §71.21.a.4.iii).
_____	N/A	6. Use of innovative/alternative methods of collection/conveyance to serve needs areas using existing wastewater treatment facilities. (Reference-Title 25, §71.21.a.4.ii.B).
_____	N/A	B. The use of individual sewage disposal systems including individual residential spray irrigation systems based on:
_____	_____	1. Soil and slope suitability. (Reference-Title 25, §71.21.a.2.ii.C).
_____	_____	2. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.21.a.2.ii.C).
_____	_____	3. The establishment of a sewage management program. (Reference-Title 25, §71.21.a.4.iv). See also Part "F" below.
_____	_____	4. The repair, replacement or upgrading of existing malfunctioning systems in

areas suitable for onlot disposal considering: (Reference-Title 25, §71.21.a.4).

_____ _____ a. Existing technology and sizing requirements of Title 25 Chapter 73. (Reference-Title 25, §73.31-73.72).

_____ _____ b. Use of expanded absorption areas or alternating absorption areas. (Reference-Title 25, §73.16).

_____ _____ c. Use of water conservation devices. (Reference-Title 25, §71.73.b.2.iii).

_____ N/A C. The use of small flow sewage treatment facilities or package treatment facilities to serve individual homes or clusters of homes with consideration of: (Reference-Title 25, §71.64.d).

_____ _____ 1. Treatment and discharge requirements. (Reference-Title 25, §71.64.d).

_____ _____ 2. Soil suitability. (Reference-Title 25, §71.64.c.l).

_____ _____ 3. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.64.c.2).

_____ _____ 4. Municipal, Local, Agency or other controls over operation and maintenance requirements through a Sewage Management Program. (Reference-Title 25, §71.64.d). See Part "F" below.

_____ N/A D. The use of community land disposal alternatives including:

_____ _____ 1. Soil and site suitability. (Reference-Title 25, §71.21.a.2.ii.C).

_____ _____ 2. Preliminary hydrogeologic evaluation. (Reference-Title 25, §71.21.a.2.ii.C).

_____ _____ 3. Municipality, Local Agency or Other Controls over operation and maintenance requirements through a Sewage Management Program (Reference-Title25, §71.21.a.2.ii.C). See Part "F" below.

_____ _____ 4. The rehabilitation or replacement of existing malfunctioning community land disposal systems. (See Part "V", B, 4, a, b, c above). See also Part "F" below.

_____ N/A E. The use of retaining tank alternatives on a temporary or permanent basis including: (Reference- Title 25, §71.21.a.4).

_____ _____ 1. Commercial, residential and industrial use. (Reference-Title 25, §71.63.e).

_____ _____ 2 Designated conveyance facilities (pumper trucks). (Reference-Title 25, §71.63.b.2).

_____ _____ 3. Designated treatment facilities or disposal site. (Reference-Title 25, §71.63.b.2).

_____ _____ 4. Implementation of a retaining tank ordinance by the municipality. (Reference-Title 25, §71.63.c.3). See Part "F" below.

_____ _____ 5. Financial guarantees when retaining tanks are used as an interim sewage disposal measure. (Reference-Title 25, §71.63.c.2).

_____ 8-3 F. Sewage Management Programs to assure the future operation and maintenance of existing and proposed sewage facilities through:

_____ N/A 1. Municipal ownership or control over the operation and maintenance of individual onlot sewage disposal systems, small flow treatment facilities, or other traditionally non-municipal treatment facilities. (Reference-Title 25, §71.21.a.4.iv).

_____ 8-3 2. Required inspection of sewage disposal systems on a schedule established by the municipality. (Reference-Title 25, §71.73.b.1.).

_____ N/A 3. Required maintenance of sewage disposal systems including septic and aerobic treatment tanks and other system components on a schedule

established by the municipality. (Reference-Title 25, §71.73.b.2).

_____ 4-3 to 4-5 4. Repair, replacement or upgrading of malfunctioning onlot sewage systems. (Reference-Title 25, §71.21.a.4.iv) and §71.73.b.5 through:

_____ N/A a. Aggressive pro-active enforcement of ordinances that require operation and maintenance and prohibit malfunctioning systems. (Reference-Title 25, §71.73.b.5).

_____ App C. b. Public education programs to encourage proper operation and maintenance and repair of sewage disposal systems.

_____ N/A 5. Establishment of joint municipal sewage management programs. (Reference-Title 25, §71.73.b.8).

_____ N/A 6. Requirements for bonding, escrow accounts, management agencies or associations to assure operation and maintenance for non-municipal facilities. (Reference-Title 25, §71.71).

_____ 8-2 G. Non-structural comprehensive planning alternatives that can be undertaken to assist in meeting existing and future sewage disposal needs including: (Reference-Title 25, §71.21.a.4).

1. Modification of existing comprehensive plans involving:

_____ N/A a. Land use designations. (Reference-Title 25, §71.21.a.4).

_____ N/A b. Densities. (Reference-Title 25, §71.21.a.4).

_____ N/A c. Municipal ordinances and regulations. (Reference-Title 25, §71.21.a.4).

_____ N/A d. Improved enforcement. (Reference-Title 25, §71.21.a.4).

_____ N/A e. Protection of drinking water sources. (Reference-Title 25, §71.21.a.4).

_____ N/A 2. Consideration of a local comprehensive plan to assist in producing sound economic and consistent land development. (Reference-Title 25, §71.21.a.4).

_____ N/A 3. Alternatives for creating or changing municipal subdivision regulations to assure long-term use of on-site sewage disposal that consider lot sizes and protection of replacement areas. (Reference-Title 25, §71.21.a.4).

_____ N/A 4. Evaluation of existing local agency programs and the need for technical or administrative training. (Reference-Title 25, §71.21.a.4).

_____ N/A H. A no-action alternative which includes discussion of both short-term and long-term impacts on: (Reference-Title 25, §71.21.a.4).

_____ _____ 1. Water Quality/Public Health. (Reference-Title 25, §71.21.a.4).

_____ _____ 2. Growth potential (residential, commercial, industrial). (Reference-Title 25, §71.21.a.4).

_____ _____ 3. Community economic conditions. (Reference-Title 25, §71.21.a.4).

_____ _____ 4. Recreational opportunities. (Reference-Title 25, §71.21.a.4).

_____ _____ 5. Drinking water sources. (Reference-Title 25, §71.21.a.4).

_____ _____ 6. Other environmental concerns. (Reference-Title 25, §71.21.a.4).

_____ 6-1 **VI. Evaluation of Alternatives**

A. Technically feasible alternatives identified in Section V of this check-list must be evaluated for consistency with respect to the following: (Reference-Title 25, §71.21.a.5.i.).

_____ 6-15 1. Applicable plans developed and approved under **Sections 4 and 5 of the Clean Streams Law or Section 208 of the Clean Water Act** (33 U.S.C.A. 1288). (Reference-Title 25, §71.21.a.5.i.A). Appendix B, Section II.A of the

Planning Guide.

_____ 6-15 2. Municipal wasteload management **Corrective Action Plans or Annual Reports** developed under PA Code, Title 25, Chapter 94. (Reference-Title 25, §71.21.a.5.i.B). The municipality's recent Wasteload Management (Chapter 94) Reports should be examined to determine if the proposed alternative is consistent with the recommendations and findings of the report. Appendix B, Section II.B of the Planning Guide.

_____ 6-16 3. Plans developed under **Title II of the Clean Water Act** (33 U.S.C.A. 1281-1299) or **Titles II and VI of the Water Quality Act of 1987** (33 U.S.C.A 1251-1376). (Reference-Title 25, §71.21.a.5.i.C). Appendix B, Section II.E of the Planning Guide.

_____ 6-16 4. **Comprehensive plans** developed under the Pennsylvania Municipalities Planning Code. (Reference-Title 25, §71.21.a.5.i.D). The municipality's comprehensive plan must be examined to assure that the proposed wastewater disposal alternative is consistent with land use and all other requirements stated in the comprehensive plan. Appendix B, Section II.D of the Planning Guide.

_____ N/A 5. **Antidegradation requirements** as contained in PA Code, Title 25, Chapters 93, 95 and 102 (relating to water quality standards, wastewater treatment requirements and erosion control) and the Clean Water Act. (Reference-Title 25, §71.21.a.5.i.E). Appendix B, Section II.F of the Planning Guide.

_____ 6-17 6. **State Water Plans** developed under the Water Resources Planning Act (42 U.S.C.A. 1962-1962 d-18). (Reference-Title 25, §71.21.a.5.i.F). Appendix B, Section II.C of the Planning Guide.

_____ 6-17 7. **Pennsylvania Prime Agricultural Land Policy** contained in Title 4 of the Pennsylvania Code, Chapter 7, Subchapter W. Provide narrative on local municipal policy and an overlay map on prime agricultural soils. (Reference-Title 25, §71.21.a.5.i.G). Appendix B, Section II.G of the Planning Guide.

_____ 6-17 8. **County Stormwater Management Plans** approved by DEP under the Storm Water Management Act (32 P.S. 680.1-680.17). (Reference-Title 25, §71.21.a.5.i.H). Conflicts created by the implementation of the proposed wastewater alternative and the existing recommendations for the management of stormwater in the county Stormwater Management Plan must be evaluated and mitigated. If no plan exists, no conflict exists. Appendix B, Section II.H of the Planning Guide.

_____ App A 9. **Wetland Protection.** Using wetland mapping developed under Checklist Section II.G, identify and discuss mitigative measures including the need to obtain permits for any encroachments on wetlands from the construction or operation of any proposed wastewater facilities. (Reference-Title 25, §71.21.a.5.i.I) Appendix B, Section II.I of the Planning Guide.

_____ App. A 10. **Protection of rare, endangered or threatened plant and animal species** as identified by the Pennsylvania Natural Diversity Inventory (PNDI). (Reference-Title 25, §71.21.a.5.i.J). Provide DEP with a copy of the completed Request For PNDI Search document. Also provide a copy of the response letter from the Department of Conservation and Natural Resources' Bureau of Forestry regarding the findings of the PNDI search. Appendix B, Section II.J of the Planning Guide.

_____ App A 11. **Historical and archaeological resource protection** under P.C.S. Title 37, Section 507 relating to cooperation by public officials with the Pennsylvania Historical and Museum Commission. (Reference-Title 25, §71.21.a.5.i.K). Provide the department with a completed copy of a Cultural Resource Notice

request of the Bureau of Historic Preservation (BHP) to provide a listing of known historical sites and potential impacts on known archaeological and historical sites. Also provide a copy of the response letter from the BHP. Appendix B, Section II.K of the Planning Guide.

_____ N/A B. Provide for the resolution of any inconsistencies in any of the points identified in Section VI.A. of this checklist by submitting a letter from the appropriate agency stating that the agency has received, reviewed and concurred with the resolution of identified inconsistencies. (Reference-Title 25, §71.21.a.5.ii). Appendix B of the Planning Guide.

_____ 6-5 through 6-14 C. Evaluate alternatives identified in Section V of this checklist with respect to applicable water quality standards, effluent limitations or other technical, legislative or legal requirements. (Reference-Title 25, §71.21.a.5.iii).

_____ 6-5 through 6-14 D. Provide cost estimates using present worth analysis for construction, financing, on going administration, operation and maintenance and user fees for alternatives identified in Section V of this checklist. Estimates shall be limited to areas identified in the plan as needing improved sewage facilities within five years from the date of plan submission. (Reference-Title 25, §71.21.a.5.iv).

_____ 3-2 E. Provide an analysis of the funding methods available to finance the proposed alternatives evaluated in Section V of this checklist. Also provide documentation to demonstrate which alternative and financing scheme combination is the most cost-effective; and a contingency financial plan to be used if the preferred method of financing cannot be implemented. The funding analysis shall be limited to areas identified in the plan as needing improved sewage facilities within five years from the date of the plan submission. (Reference-Title 25, §71.21.a.5.v).

_____ N/A F. Analyze the need for immediate or phased implementation of each alternative proposed in Section V of this checklist including: (Reference-Title 25, §71.21.a.5.vi).

_____ _____ 1. A description of any activities necessary to abate critical public health hazards pending completion of sewage facilities or implementation of sewage management programs. (Reference-Title 25, §71.21.a.5.vi.A).

_____ _____ 2. A description of the advantages, if any, in phasing construction of the facilities or implementation of a sewage management program justifying time schedules for each phase. (Reference-Title 25, §71.21.a.5.vi.B).

_____ 8-1 and 3-1 G. Evaluate administrative organizations and legal authority necessary for plan implementation. (Reference - Title 25, §71.21.a.5.vi.D.).

_____ 7-1 **VII. Institutional Evaluation**

A. Provide an analysis of all existing wastewater treatment authorities, their past actions and present performance including:

_____ _____ 1. Financial and debt status. (Reference-Title 25, §71.61.d.2).

_____ _____ 2. Available staff and administrative resources. (Reference-Title 25, §71.61.d.2)

_____ 7-3 3. Existing legal authority to:

_____ 7-3 a. Implement wastewater planning recommendations. (Reference-Title 25, §71.61.d.2).

_____ 7-1 b. Implement system-wide operation and maintenance activities. (Reference-Title 25, §71.61.d.2).

_____ 3-1 c. Set user fees and take purchasing actions. (Reference-Title 25, §71.61.d.2).

_____ N/A d. Take enforcement actions against ordinance violators. (Reference-Title 25,

§71.61.d.2).

_____	3-1	e. Negotiate agreements with other parties. (Reference-Title 25, §71.61.d.2).
_____	3-1	f. Raise capital for construction and operation and maintenance of facilities. (Reference-Title 25,§71.61.d.2).
_____	7-2	B. Provide an analysis and description of the various institutional alternatives necessary to implement the proposed technical alternatives including:
_____	N/A	1. Need for new municipal departments or municipal authorities. (Reference-Title 25, §71.61.d.2).
_____	3-1	2. Functions of existing and proposed organizations (sewer authorities, onlot maintenance agencies, etc.). (Reference-Title 25, §71.61.d.2).
_____	3-1	3. Cost of administration, implementability, and the capability of the authority/agency to react to future needs. (Reference-Title 25, §71.61.d.2).
_____	N/A	C. Describe all necessary administrative and legal activities to be completed and adopted to ensure the implementation of the recommended alternative including:
_____	N/A	1. Incorporation of authorities or agencies. (Reference-Title 25, §71.61.d.2).
_____	N/A	2. Development of all required ordinances, regulations, standards and inter-municipal agreements. (Reference-Title 25, §71.61.d.2).
_____	N/A	3. Description of activities to provide rights-of-way, easements and land transfers. (Reference-Title 25, §71.61.d.2).
_____	N/A	4. Adoption of other municipal sewage facilities plans. (Reference-Title 25, §71.61.d.2).
_____	8-1	5. Any other legal documents. (Reference-Title 25, §71.61.d.2).
_____	9-1	6. Dates or timeframes for items 1-5 above on the project's implementation schedule.
_____	8-3	D. Identify the proposed institutional alternative for implementing the chosen technical wastewater disposal alternative. Provide justification for choosing the specific institutional alternative considering administrative issues, organizational needs and enabling legal authority. (Reference-Title 25, §71.61.d.2).
_____	9-1	**VIII. Implementation Schedule and Justification for Selected Technical & Institutional Alternatives**
		A. Identify the technical wastewater disposal alternative which best meets the wastewater treatment needs of each study area of the municipality. Justify the choice by providing documentation which shows that it is the best alternative based on:
_____	9-1	1. Existing wastewater disposal needs. (Reference-Title 25, §71.21.a.6).
_____	9-1	2. Future wastewater disposal needs. (five and ten years growth areas). (Reference-Title 25, §71.21.a.6).
_____	8-1	3. Operation and maintenance considerations. (Reference-Title 25, §71.21.a.6).
_____	6-1 through 6-15	4. Cost-effectiveness. (Reference-Title 25, §71.21.a.6).
_____	N/A	5. Available management and administrative systems. (Reference-Title 25, §71.21.a.6).

_____	3-2	6. Available financing methods. (Reference-Title 25, §71.21.a.6).
_____	App. A	7. Environmental soundness and compliance with natural resource planning and preservation programs. (Reference-Title 25, §71.21.a.6).
_____	8-2	B. Designate and describe the capital financing plan chosen to implement the selected alternative(s). Designate and describe the chosen back-up financing plan. (Reference-Title 25, §71.21.a.6)
_____	App A	C. Designate and describe the implementation schedule for the recommended alternative, including justification for any proposed phasing of construction or implementation of a Sewage Management Program. (Reference – Title 25 §71.31d)
		IX. Environmental Report (ER) generated from the Uniform Environmental Review Process (UER)
_____	App A	A. Complete an ER as required by the UER process and as described in the DEP Technical Guidance 381-5511-111. Include this document as "Appendix A" to the Act 537 Plan Update Revision. Note: *An ER is required only for Wastewater projects proposing funding through any of the funding sources identified in the UER.*

PENNVEST I.D. No. _____

ADDITIONAL REQUIREMENTS FOR PENNVEST PROJECTS

Municipalities that propose to implement their official sewage facilities plan updates with PENNVEST funds must meet six additional requirements to be eligible for such funds. See A Guide for Preparing Act 537 Update Revisions (362-0300-003), Appendix N for greater detail or contact the DEP regional office serving your county listed in Appendix J of the same publication.

DEP Use Only	Indicate Page #(s) in Plan	Item Required
_____	_____	1. Environmental Impact Assessment. (Planning Phase) The Uniform Environment Review (UER) replaces the Environmental Impact Assessment that was a previous requirement for PENNVEST projects.
_____	_____	2. Cost Effectiveness (Planning Phase) The cost-effectiveness analysis should be a present-worth (or equivalent uniform annual) cost evaluation of the principle alternatives using the interest rate that is published annually by the Water Resources Council. Normally, for PENNVEST projects the applicant should select the most cost-effective alternative based upon the above analysis. Once the alternative has been selected the user fee estimates should be developed based upon interest rates and loan terms of the selected funding method.
_____		3. Second Opinion Project Review. (Design Phase)
_____		4. Minority Business Enterprise/Women's Business Enterprise (Construction Phase)
_____		5. Civil Rights. (Construction Phase)
_____		6. Initiation of Operation/Performance Certification. (Post-construction Phase)

I/A TECHNOLOGIES
PARTIAL LISTING OF INNOVATIVE AND ALTERNATIVE TECHNOLOGIES

TREATMENT TECHNOLOGIES
Aquaculture
Aquifer Recharge
Biological Aerated Filters
Constructed Wetlands
Direct Reuse (NON-POTABLE)
Horticulture
Overland Flow
Rapid Infiltration
Silviculture
Microscreens
Controlled Release Lagoons
Swirl Concentrator

ENERGY RECOVERY TECHNOLOGIES
Anaerobic Digestion with more than 90 percent Methane Recovery
Cogeneration of Electricity
Self-Sustaining Incineration

SLUDGE TREATMENT TECHNOLOGIES

Aerated Static Pile Composting
Enclosed Mechanical Composting (In vessel)
Revegetation of Disturbed Land
Aerated Windrow Composting

INDIVIDUAL & SYSTEM-WIDE COLLECTION TECHNOLOGIES
Cluster Systems
Septage Treatment
Small Diameter Gravity Sewers
Step Pressure Sewers
Vacuum Sewers
Variable Grade Sewers
Septic Tank Effluent Pump with Pressure Sewers

Delaware County Planning Department
and the
Delaware County Regional Water
Quality Control Authority

Act 537 Sewage Facilities Plan Revision

Re-Rate Of The Western Regional Treatment Plant

August 2006

Prepared by
Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, PA 19380

Act 537 Sewage Facilities Plan Revision

Re-Rate of the Western Regional Treatment Plant

Prepared for

DELAWARE COUNTY REGIONAL
WATER QUALITY CONTROL AUTHORITY
(DELCORA)

Chester, Pennsylvania

Prepared by

WESTON SOLUTIONS, INC.
West Chester, Pennsylvania

August 2006

W.O. No. 05623.019.012.0002

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LIST OF ACRONYMS

Act 537 Plan	Delaware County Act 537 Sewage Facilities Plan
BOD_5	5-day biological oxygen demand
BTSA	Bethel Township Sewer Authority
CDCA	Central Delaware County Authority
CDPS	Central Delaware Pump Station
CEDA	Chester Economic Development Authority
COWAMP	Clean Water Act Comprehensive Water Quality Management Plan
CPS	Chester Pump Station
CSO	combined sewer overflow
CZM	Coastal Zone Management
DCPD	Delaware County Planning Department
DELCORA	Regional Water Quality Control Authority
DMR	Discharge Monitoring Report
DVRPC	Delaware Valley Regional Planning Commission
EPA	U.S. Environmental Protection Agency
GIS	geographic information system
GPD	gallon per day
I&I	Inflow and Infiltration
IDP	Infrastructure Development Program
ISRP	Industrial Site Reuse Program
KOZ	Keystone Opportunity Zone
MGD	million gallons per day
MHB	Marcus Hook Borough
MPC	Municipalities Planning Code
NCPI	National Clay Pipe Institute
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetland Inventory
OCRM	Office of Ocean and Coastal Resource Management
OGP	Opportunity Grant Program
OLDS	on-lot disposal systems
PADEP	Pennsylvania Department of Environmental Protection
PCS/SCADA	process control system/system control and data acquisition
PECO	Philadelphia Electric Company
PEDFA	Pennsylvania Economic Development Financing Authority
PENNVEST	Pennsylvania Infrastructure Investment Authority

LIST OF ACRONYMS (CONTINUED)

PNDI	Pennsylvania Natural Diversity Index
PSWPCP	City of Philadelphia Southwest Water Pollution Control Plant
RAS	Recycle Activated Sludge
SDCA	Southern Delaware County Authority
SEO	sewage enforcement officer
STP	Sewage Treatment Plant
SWMM	Stormwater Management Model
TMDL	total maximum daily load
UER	Uniform Environmental Review
WRTP	Western Regional Treatment Plant

1. PREVIOUS WASTEWATER PLANNING

Over the past few years, Delaware County Regional Water Quality Control Authority (DELCORA) has focused efforts on upgrades at the Western Regional Treatment Plant, located in the City of Chester. DELCORA is now implementing a strategic plan that focuses on the collection system, maintenance management, and operations.

1.1 INTRODUCTION

Five municipalities within Delaware County have identified significant future growth and/or development projects and the consequent need for increased sewerage treatment. The City of Chester, Chester Township Bethel Township, Upper Providence Township, and Newtown Township have authorized DELCORA to prepare this *Delaware County Act 537 Sewage Facilities Plan (Act 537 Plan) Update* to support a re-rate of the Western Regional Treatment Plant (WRTP) to discharge 50 million gallons per day (MGD). Trainer Borough has also been included in this *Act 537 Plan Update* because, although they do not expect increased flows due to growth, significant upgrades to their collection system are planned. Replacement of a force main and pump station within the Borough due to inadequate capacity and frequent failure is addressed in a consent decree. The previously listed municipalities are the focus of this *Act 537 Plan Update* and are included in the WRTP re-rate planning area. Figure 1-1 shows the locations of the municipalities within the planning area. DELCORA has demonstrated that the WRTP facility is physically capable of receiving and treating 50 MGD of wastewater. DELCORA prepared and submitted to PADEP a report, dated February 14, 2003 (Appendix A), demonstrating the WRTP's physical capability to support a re-rate to 50 MGD. The ability of DELCORA's collection system to convey flows from the planning area to the WRTP is documented in this report.

An analysis of the existing gravity interceptor system is presented in this study to demonstrate the capacity to convey flows to the WRTP. The details of segments of the interceptor system that have limited capacity are presented in Sections 3 and 4 of this report. Unforeseen future flows would most likely be conveyed to the WRTP via existing or new force mains. The existing force main system has capacity to accept additional future flows.

Radnor Township
Newtown Township
Haverford Township
Marple Township
Millbourne Boro
Upper Darby Township
East Lansdowne
Lansdowne Boro
Yeadon Boro
Edgmont Township
Upper Providence Township
Springfield Township
Clifton Heights Boro
Upper Darby Township
Aldan Boro
Darby Boro
Collingdale Boro
Colwyn Boro
Morton Boro
Darby Township
Sharon Hill Boro
Media Boro
Thornbury Township
Middletown Township
Swarthmore Boro
Rutledge Boro
Glenolden Boro
Darby Township
Rose Valley Boro
Chester Heights Boro
Springfield Township
Ridley Township
Folcroft Boro
Prospect Park Boro
Norwood Boro
Nether Providence Townshi
Ridley Park Boro
Concord Township
Aston Township
Brookhaven Boro
Parkside Boro
Chadds Ford Township
Tinicum Township
Upland Boro
Eddystone Boro
Chester Township
Bethel Township
City of Chester
Upper Chichester Township
DELAWARE RIVER
Trainer Boro
Lower Chichester Township
Marcus Hook Boro

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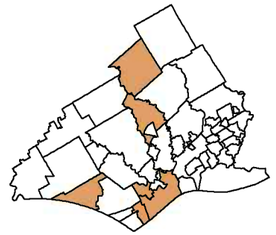
LEGEND

- DELCORA Served Community
- Other
- Planning Area Municipalities

N



Location Map

1 0.5 0 1 2 Miles

WESTON SOLUTIONS

DELCORA

ACT 537: SEWAGE FACILITIES PLAN UPDATE

FIGURE 1-1

Planning Area Municipalities

1.2 ACT 537 PLANNING BACKGROUND

The Pennsylvania Sewage Facilities Act of 1966 (as amended), more commonly referred to as Act 537, is the primary legislation governing sewage facilities planning and regulation. Act 537 requires municipalities to submit, either individually or jointly, Official Sewage Facilities Plans to the Pennsylvania Department of Environmental Protection (PADEP). This Act 537 plan update, prepared by DELCORA, is an addendum to the 2004 Act 537 Plan for Western Delaware County. These plans contain information concerning existing needs of each municipality, as well as alternatives for providing adequate wastewater facilities to serve the needs of each municipality in the future. Act 537 also calls for municipalities to periodically revise their Act 537 plans as conditions change or as the need arises. PADEP is responsible for the enforcement of regulations adopted pursuant to Act 537.

In Delaware County, Act 537 regulations are implemented through wastewater planning and coordination on a variety of levels including regional, county, and municipal. On a county level, the Delaware County Planning Department (DCPD) and the DELCORA coordinated efforts to prepare a countywide sewage facilities plan and update it according to Act 537. DELCORA was created in 1971 by ordinance of the Delaware County Commissioners with the purpose of implementing the official *Delaware County Act 537 Sewage Facilities Plan (Act 537 Plan)*, which was published in 1971 and adopted by all municipalities that comprise Delaware County. In accordance with the *Act 537 Plan*, DELCORA was authorized to finance, construct, operate, and maintain interceptor systems, pump stations, force mains, and treatment plants in Delaware County with the exception of the following systems:

- Upper Darby-Haverford (the area currently served by the City of Philadelphia).
- Southern Delaware County Authority (SDCA).
- Media.
- Rose Valley.
- Brookhaven.
- Tinicum.

DELCORA serves much of Delaware County through the collection and treatment of wastewater from the municipalities that comprise the County. As Delaware County developed, the eastern

and western portions of the County exhibited different planning needs, which led DELCORA to designate the Eastern and Western Service Areas. Separate Act 537 plan updates were prepared for each of the two service areas. The most recent plans for the Eastern and Western Service Areas were completed and adopted in 2002 and 2004, respectively (DCPD 2002 and DCPD/DELCORA 2004). Sewage facilities planning for areas not included in this update can be found in the Act 537 Plans for the Eastern and Western Service Areas.

DELCORA's system of interceptors, pump stations, and force mains conveys wastewater flows to one of two treatment plants: the City of Philadelphia Southwest Water Pollution Control Plant (PSWPCP) and DELCORA's Western Regional Treatment Plant (WRTP) in the City of Chester. A significant amount of the wastewater flows collected from the eastern portion of Delaware County is conveyed to the PSWPCP and a significant amount of the flows from the western portion is conveyed to the WRTP.

This *Act 537 Plan Update* was prepared to support a re-rate for DELCORA's WRTP from 44 MGD to 50 MGD. The document has been prepared in accordance with *Sewage Facilities Planning: A guide for Preparing Act 537 Update Revisions* (PADEP 1998). Previous planning efforts in Delaware County that have led to the current focus of this plan are described in the 2004 Act 537 Plan Update for the Western Service Area (DCPD/DELCORA, 2004).

1.2.1 Delaware County Comprehensive Plan

As of September 2005, Delaware County did not have an adopted comprehensive plan. However, a County Comprehensive Plan is currently being prepared, as provided for under Act 247, and is to be adopted upon completion. It is expected that the County Comprehensive Plan will re-examine existing and potential development cores, activity centers, and residential areas. It will also address the need for balancing new development in less densely populated areas with opportunities for redevelopment of existing urbanized areas.

Until the County Comprehensive Plan is completed, the *Delaware County Land Use Plan 2000*, which was published in January 1976, is the basic source of information regarding future development within the County. The *Delaware County Land Use Plan 2000* was based on economic and population trend data available at the time. Although this plan was never officially adopted by the County Council, it was an important element in the regional plan, which was

adopted as part of the regional development guide by the Delaware Valley Regional Planning Commission (DVRPC) in 1978.

1.2.2 Delaware County Act 537 Plan

On a county level, the DCPD and DELCORA have coordinated efforts to prepare countywide sewage facilities plans and update them according to Act 537. Act 537 is the primary legislation governing sewage facilities planning and regulation. In accordance with Act 537 regulations, sewage facilities plans contain information concerning existing needs of each municipality, as well as alternatives for providing adequate wastewater facilities to serve the needs of each municipality in the future. Act 537 also calls for municipalities to periodically revise their Act 537 plans as conditions change or as the need arises. PADEP is responsible for the enforcement of regulations adopted pursuant to Act 537.

In addition to providing legislation for sewage facilities planning, Act 537 requires permits to be issued for the construction, installation, or alteration of individual and community wastewater systems. Rules and regulations regarding community and individual systems are developed by PADEP and adopted by the State Environmental Quality Board. A State Board of Certification of Sewage Enforcement Officers administers Pennsylvania's sewage enforcement officer (SEO) certification programs. The rules and regulations promulgated by PADEP in accordance with Act 537 are contained within Chapters 71, 72, and 73 of PADEP's Title 25: Rules and Regulations. The following list briefly summarizes the provisions of these chapters:

- **Chapter 71: Administration of Sewage Facilities Program**: This program provides a comprehensive sewage planning mechanism to identify and resolve existing sewage disposal problems, to avoid potential sewage problems resulting from new land development, and to provide for the future sewage disposal needs of a municipality.
- **Chapter 72: Administration of Sewage Facilities Permitting Program**: This program establishes requirements for permitting associated with installation of individual and community on-lot wastewater disposal systems and regulates the administration of permitting functions by local agencies and SEOs.
- **Chapter 73: Standards for Sewage Disposal Facilities**: This program establishes requirements for the design, location, and construction of sewage facilities. It is administered locally by the municipal SEO.

In Delaware County, Act 537 regulations are administered at a county level through the development of the *Delaware County Act 537 Sewage Facilities Plan* for the Eastern and Western service areas (DCPD 2002 and DCPD/DELCORA 2004). The Environmental Planning section of the DCPD coordinated efforts with DELCORA in preparing these Act 537 plans and subsequent updates for the eastern and western service areas. The most updated plans for the eastern and western service areas were completed and adopted in 2002 and 2004, respectively. Recommendations presented in the most recent updates of the *Act 537 Plans* were accepted.

One of the recommendations of the *Act 537 Plan* for the Eastern Service Area was to complete the construction of the diversion from Central Delaware Pump Station (CDPS) to Chester pump station (CPS), which was underway at the time the plan was adopted in 2002. The diversion is now completed, which allows a portion of the flow passing through the CDPS to be diverted to the CPS and ultimately to the WRTP. The project aided in maximizing the capacity of the Eastern and Western Service Areas.

Planning efforts addressed in the most recent *Act 537 Sewage Facilities Plan Update* for the Western Service Area (DCPD/DELCORA 2004) included the development of alternatives for increasing the capacity of the collection and treatment systems primarily due to increasing population. The alternatives included increasing capacity at existing facilities. The WRTP now has an approved re-rate from 44 MGD to 50 MGD. This Act 537 Plan update includes a capacity analysis of the existing conveyance system and recommended alternatives for ensuring adequate conveyance to the 50-MGD WRTP.

1.3 DELAWARE COUNTY REGIONAL WATER QUALITY CONTROL AUTHORITY

DELCORA's service area is divided into eastern and western regional drainage districts as established in the 1974 Albreit and Friel plan. The Eastern and Western Act 537 Plan updates address the needs of their respective DELCORA service areas. This *Act 537 Plan Update* includes municipalities from both service areas. In 1999, the CDPS Diversion Study was completed to assess the feasibility of diverting a portion of wastewater flows passing through the CDPS to the WRTP via construction of a force main to provide a direct tie in to the Chester force main. The result of this study was the construction of a force main to divert a portion of the flow from CDPS to the WRTP (DELCORA 1998).

Wastewater flows generated in these western areas of Delaware County are conveyed to DELCORA's WRTP in the City of Chester. DELCORA's Western Service Area includes Upper Chichester and Chester Townships; portions of Nether Providence Township; Marcus Hook; Trainer, Upland, Parkside, and Eddystone Boroughs; the City of Chester; and the southern portion of Brookhaven Borough.

As part of its National Pollutant Discharge Elimination System (NPDES) permit for the WRTP, DELCORA was tasked with developing a combined sewer overflow (CSO) program. The fundamental purpose of DELCORA's CSO program is to minimize the impacts of CSOs on the quality of the receiving surface waters by developing a long-term strategy that is both technically viable and financially feasible. To meet this objective, DELCORA has developed a Long-Term CSO Control Plan that meets the regulatory guidelines established by the United States Environmental Protection Agency (EPA) and PADEP as well as DELCORA's financial obligations to its customers in Delaware County.

Recent planning efforts focused on the Western Service Area include the *Riverfront Development Study* (WESTON 2005). This study addressed future development along the riverfront and the consequent generation of additional wastewater flow that would discharge to DELCORA's collection system. Findings of this study are discussed in detail in Section 4.

1.4 SOUTHERN DELAWARE COUNTY AUTHORITY (SDCA)

The Southern Delaware County Authority (SDCA) serves Upper Chichester Township and a portion of Bethel Township. SDCA owns and operates a sanitary sewer collection system and two pump stations: Beech Street and Naaman's Creek. Most sewage collected by SDCA is conveyed to DELCORA by Naaman's Creek Pump Station via a tie in to the Sun Oil/Marcus Hook force main. Wastewater from the western portion of Bethel Township flows to the City of Wilmington's 90-MGD treatment plant in an agreement with New Castle County, Delaware. An alternative to redirect this flow to the WRTP is being studied by Bethel Township.

1.5 CENTRAL DELAWARE COUNTY AUTHORITY (CDCA)

The Central Delaware County Authority (CDCA) serves the following municipalities:

- Eddystone Borough.
- Marple Township.
- Morton Borough.
- Nether Providence Township.
- Norwood Borough.
- Prospect Park Borough.
- Ridley Park Borough.
- Ridley Township.
- Rutledge Borough.
- Springfield Township.
- Swarthmore Borough.

A Capacity Analysis and Future Flow Study (Catania, 2005) was completed in August 2005 to address requests from Newtown and Upper Providence Townships to become members of the CDCA and tie in to the Crum Creek Interceptor. The Capacity Analysis reported an additional 0.31 MGD average daily flow from CDCA'a existing service area and an additional 2.45 MGD average daily flow is estimated to be contributed by Newtown and Upper Providence Townships when they tie in to the system. An additional 0.09 MGD average daily flow is anticipated to come from the new municipalities over time.

The CDCA discharges wastewater to DELCORA's WRTP via the Central Delaware Pump Station. Sewer authorities, such as the SDCA and the CDCA, are authorized to finance, construct and operate public sewer facilities within their designated service areas.

2. PHYSICAL AND DEMOGRAPHIC ANALYSIS

2.1 DESCRIPTION OF THE PLANNING AREA

Delaware County is located in the southeastern corner of the Commonwealth of Pennsylvania. The County is bounded on the east by the City of Philadelphia, on the southeast by the Delaware River and the State of New Jersey, and on the southwest by the State of Delaware. Figure 2-1 shows Delaware County in its regional setting.

For the purposes of this *Act 537 Plan Update*, the planning area is defined as the five municipalities that have identified significant growth and/or development projects. These municipalities are Chester Township, Bethel Township, Newtown Township, Upper Providence Township, and the City of Chester. Trainer Borough is included in this *Act 537 Plan Update* because one of the two pump stations and all of the existing force mains that convey flow to the WRTP require replacement. On August 15, 2005, Trainer transferred ownership of the collection system to DELCORA. Figure 1-1 presents the municipalities that are defined as the planning area for this update.

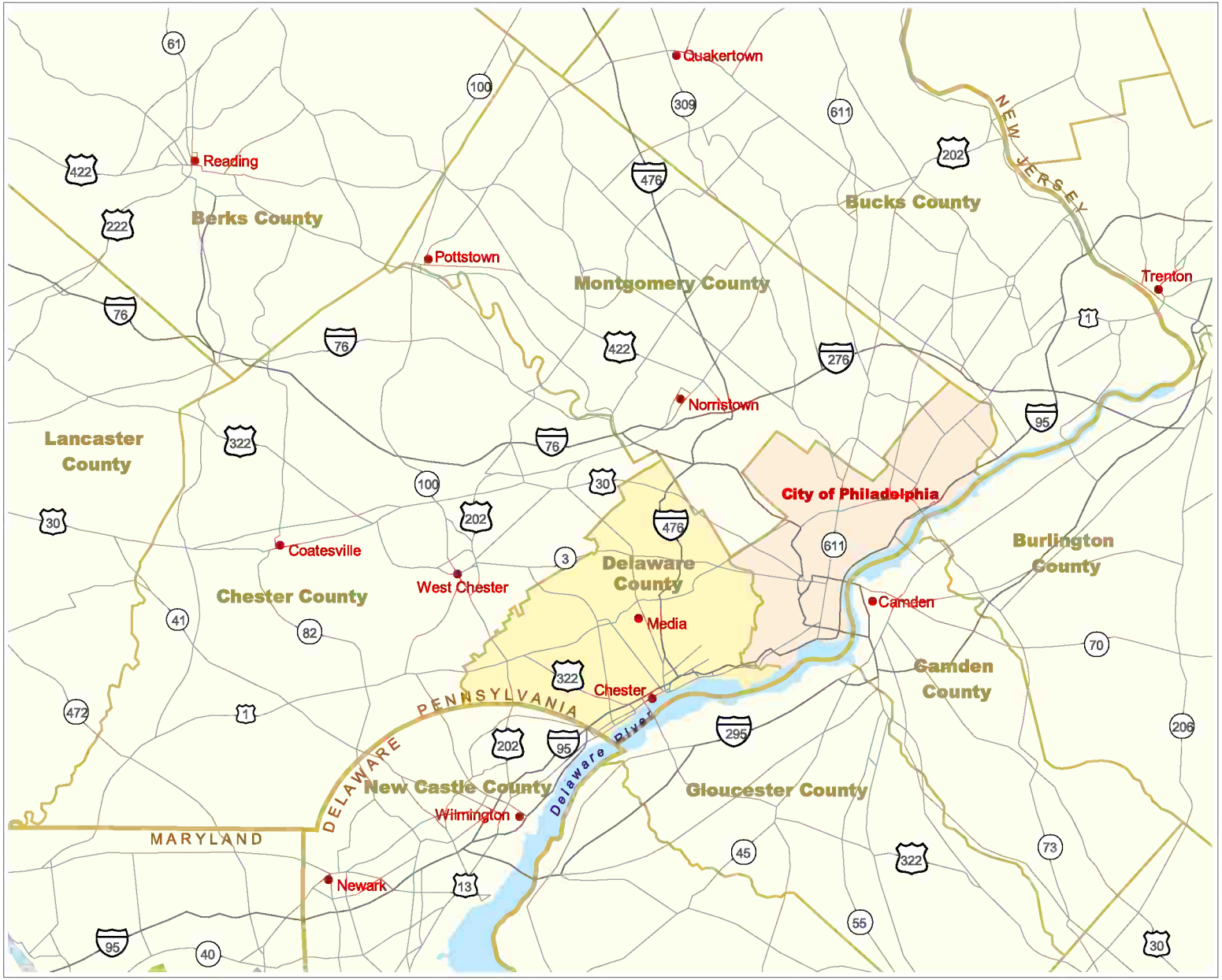
The WRTP is located in Chester, Delaware County. The WRTP receives both sanitary/industrial wastewater flows and combined sanitary wastewater/storm water flows from the City of Chester, which has both separate and combined sewers. Several neighboring municipalities (Upland Borough, Brookhaven Borough, Parkside Borough, Nether Providence Township, Eddystone Borough, Lower Chichester, and Marcus Hook) discharge sanitary wastewater flows directly to the interceptors leading to the WRTP.

2.2 ENVIRONMENTAL CHARACTERISTICS

The western portion of Delaware County is hilly. This area lies north and west of the Atlantic Coastal Plain. It is the beginning of the Piedmont Province, which extends 60 to 80 miles inland from the Atlantic Coastal Plain. This area includes rolling or undulating uplands, low hills, and well-drained soils. These features give the County its rolling surface, which ranges from an elevation of 480 feet (in Marple Township) to sea level (at the Delaware River). Detailed descriptions of the geologic features, surface drainage features, and soils in the planning area are

FIGURE 2-1

Regional Setting



LEGEND

- Roads
- County Boundary
- State Boundary

N
W E
S

Scale in Miles

2 0 2 4 6 8

Disclaimer: This map is for analytical purposes only. The reliability of this map depends on the accuracy of the underlying data sources which have not been verified.

Data Source:
- Pennsylvania Spatial Data Access (PASDA) Web Site, http://www.pasda.psu.edu
- Delaware County Planning Department (DCPD)

presented in the 2004 Act 537 Plan for Western Delaware County. These details are not included in this document because this update only proposes to provide public sewer service to additional municipalities within Delaware County. On-lot disposal systems are not proposed in this plan update.

2.3 POPULATION

Analyses of population data and trends are presented in the Act 537 Studies for the Eastern and Western regions of Delaware County. The primary driver for the planned expansion of the WRTP was the focus on revitalization projects in Chester Township and the City of Chester. Over the past 20 years, wastewater flows from industries in Chester have declined and have been replaced with flows from growing populations in surrounding communities. The current goals for revitalizing Chester by developing former industrial sites is projected to significantly increase flows to the WRTP. Population increases in some of the existing service area municipalities are accounted for in the flow projections.

2.4 RECENT TRENDS IN COUNTY DEVELOPMENT

Although specific trends in Delaware County development will be discussed in Section 4, recent development trends indicate that areas from Middletown Township west to the Chester County border are developing most quickly. Building permits for 5,731 units were issued in Delaware County from 2000 through September 2005. DCPD records document that building permits for 1,829 units were issued from 2000 through September 2005. Areas experiencing the greatest level of new development during 2004 and 2005 include Bethel, Concord, Edgmont, Marple, Middletown, Newtown, Thornbury, and Upper Chichester Townships.

Development activity along U.S. Route 30 in Radnor Township, PA Route 3 in Marple Township, U.S. Route 1 in Nether Providence, and MacDade Boulevard in Ridley Township has also increased significantly since the completion of the Mid-County Expressway, I-476 (Blue Route), in December 1992.

3. EXISTING WASTEWATER CONVEYANCE AND TREATMENT SYSTEMS

This chapter describes DELCORA's existing collection and treatment systems, and summarizes the results of capacity evaluations performed for these systems.

3.1 DESCRIPTION OF EXISTING DELCORA FACILITIES

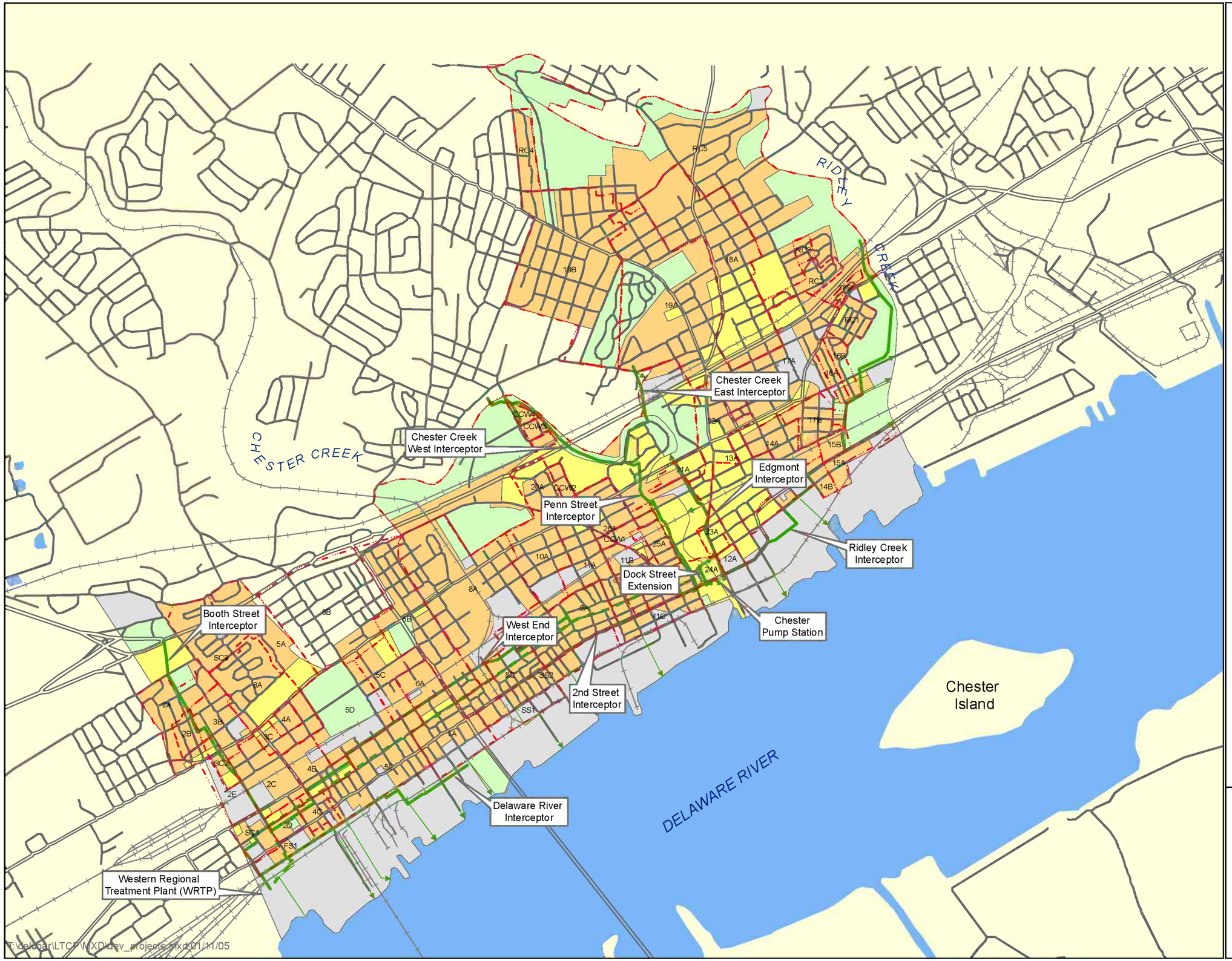
3.1.1 Treatment Facility Description

The DELCORA WRTP is located at the foot of Booth Street in the City of Chester and serves DELCORA's western service area. The location of the plant is shown in Figure 3-1. The plant, which currently has an approved NPDES permit at 44 MGD, discharges to the Delaware River under NPDES permit number PA 0027103. DELCORA prepared and submitted to PADEP a report, dated February 14, 2003, demonstrating that the WRTP has the physical facility to support a re-rate to 50 MGD. In a letter dated 21 August 2003, PADEP agreed with the assessment (see Appendix A for the referenced correspondence with PADEP).

In 2005, DELCORA averaged 38.87 MGD of flow through the WRTP with a maximum flow of 80.79 MGD. The plant employs an activated sludge process that provides primary and secondary treatment levels. The treatment processes include grit removal, primary clarification, aeration, secondary clarification, and disinfection by chlorination. The design organic loading for the plant is 61,712 pounds (lbs) average influent 5-day biological oxygen demand (BOD_5) per day. During 2005, the WRTP averaged 45,549 lbs of BOD_5 per day in the influent and achieved approximately 95.52% removal in the effluent. Sludge is thickened, dewatered, and incinerated. The ash is stored and transported off-site for disposal.

Approximately 30% of DELCORA's WRTP flow is categorized as industrial wastewater. Note that 91% of industrial flows are generated by two major industries, Kimberly-Clark Tissue Company and Sun Company-Marcus Hook Refinery. The list of the significant industrial users that discharge to the WRTP is shown in Table 3-1.

Significant industrial users discharging to the WRTP must have a DELCORA-issued Industrial Waste Permit in accordance with the EPA-approved treatment program. Pretreated industrial wastewater must comply with limits established by DELCORA and approved by EPA.



LEGEND:

- Industrial
- Commercial
- Residential
- Open
- Drainage Area Boundary
- Interceptor
- Combined Sewer Outfall
- Force Main

N

0 300

Feet

Delaware County Regional Water Quality Control Authority (DELCORA)

Long Term CSO Control Plan
City of Chester Combined Sewer System

FIGURE 3-1
LOCATIONS OF WRTP AND DELCORA INTERCEPTOR SYSTEM

Table 3-1

Significant Industrial Users Discharging to the WRTP

Significant Industrial User	Permitted Discharge (gpd)
Sun Company-Marcus Hook Refinery	15,000,000
Kimberly-Clark Tissue Co.	10,500,000
F.P.L. Energy	1,050,000
Liberty	450,000
Epsilon	200,000
P.Q. Corporation	100,000
Foamex	100,000
Bucks County	92,000
Ace Linen	85,000
Stoney Creek Technologies, LLC	80,000
Exelon (PECO)	40,000
Alloy Surfaces	35,000
Congoleum	33,500
GS Roofing	25,000
Covanta	24,000
Rhodia	24,000
Norquay	15,000
Esschem	15,000
Healthmats	9,000
Greif	4,500

3.1.1.1 Previous Upgrades

Over the past several years, DELCORA has been in the process of implementing capital improvements to upgrade treatment processes at the WRTP. In 1989, DELCORA began a long-term program to adjust the equipment and treatment process to improve effluent quality. Recent major upgrades that have been completed at the WRTP include the following:

- Dry ash handling system.
- Belt filter press installation.
- Modifications in the delivery and storage of chlorine.

- Overhaul of the secondary clarifiers.
- Modifications to the raw sewage pump station (EPS-1).
- Construction of a fifth clarifier.
- Ash scrubber line replacement.
- Recycle Activated Sludge (RAS) line replacement.
- Automation of process control system/system control and data acquisition (PCS/SCADA).
- PS3 Piping Replacement.
- Rehabilitation of the grit removal system.
- Replacement of the mechanical surface aerators with submerged fine bubble diffusers and new electrical substation (construction to finish in 2005).
- Incinerator improvements.
- Rehabilitation of pipe gallery and crack repair.
- Belt filter press odor control improvements.
- Architectural upgrades and renovations of B-5 and B-2 Buildings and Building B-3 locker rooms.
- Replacement of the mechanical surface aerators with submerged fine bubble diffusers (construction was completed in 2005).

3.1.1.2 Current WRTP Status

The WRTP discharges high-quality effluent on a routine basis, as demonstrated in DELCORA's monthly Discharge Monitoring Report (DMR) and Chapter 94 Annual Report, both of which are submitted to PADEP. Occasions on which discharge permit limits were temporarily exceeded are documented in the DMRs and annual Chapter 94 reports. DELCORA takes swift action to correct any problems; specific remedial actions are also documented in the DMRs.

3.1.2 Collection System Description

The DELCORA WRTP receives wastewater by means of both a gravity interceptor system and a pressure force main system. These systems are described in the following paragraphs.

The gravity interceptor system consists of the interceptors shown in Figure 3-1, which range in size from 8 inches to 54inches. The City of Chester has both separate and combined sewers; the combined sewer system conveys sanitary/industrial wastewater and stormwater flows. Several neighboring municipalities (Trainer Borough, Chester Township, Upland Borough, Brookhaven Borough, Parkside Borough, Nether Providence Township, Eddystone Borough, Lower Chichester, and Marcus Hook) also discharge sanitary and industrial wastewater flows directly to the interceptors leading to the WRTP.

The 10 gravity interceptors that convey flows to the WRTP include the following:

- Ridley Creek.
- Second Street.
- Dock Street extension.
- Penn Street.
- Chester Creek East.
- Chester Creek West.
- Edgmont Ave.
- Booth Street.
- West End.
- Delaware River.

There are 27 regulators within the City of Chester combined sewer system, which, during storm periods, control the rate of flow from the combined sewers to the WRTP. As the flow rates increase, the regulators close, preventing additional flow to the WRTP and allowing for overflow to the receiving waters. The hydraulic system and regulators controlling discharges to the combined sewer outfalls respond rapidly to storm events, essentially routing flows to the outfalls early in the storm events.

The overflows discharge at 27 outfalls to the Delaware River, Chester River, and Ridley Creek (Outfalls 002 to 027 and 030). The WRTP and CSO outfalls discharge under NPDES Permit No. PA0027103, issued to DELCORA by PADEP on 21 July 1993. A schematic of the gravity interceptor system is included in Figure 3-1.

The DELCORA pressure force main system serving the WRTP service area includes the following two pump stations:

- CDPS – Central Delaware County Pump Station (40 MGD capacity, flow split between PSWPCP and WRTP)

- CPS – Chester Pump Station (26 MGD capacity; permitted to by-pass flows received above a 30 MGD flow rate during storm periods).

Wastewater discharged from the CDPS is split between flow discharged to the WRTP, and a portion conveyed to the PSWPCP. The flow split from CDPS to the WRTP is currently limited to 13.3 MGD, based on available capacity at the WRTP, and maintained by a motorized control valve. The portion of flow from the CDPS which is diverted to the PSWPCP joins with flow from the Darby Creek and Muckinipates Pump Stations, both of which serve DELCORA's eastern service area.

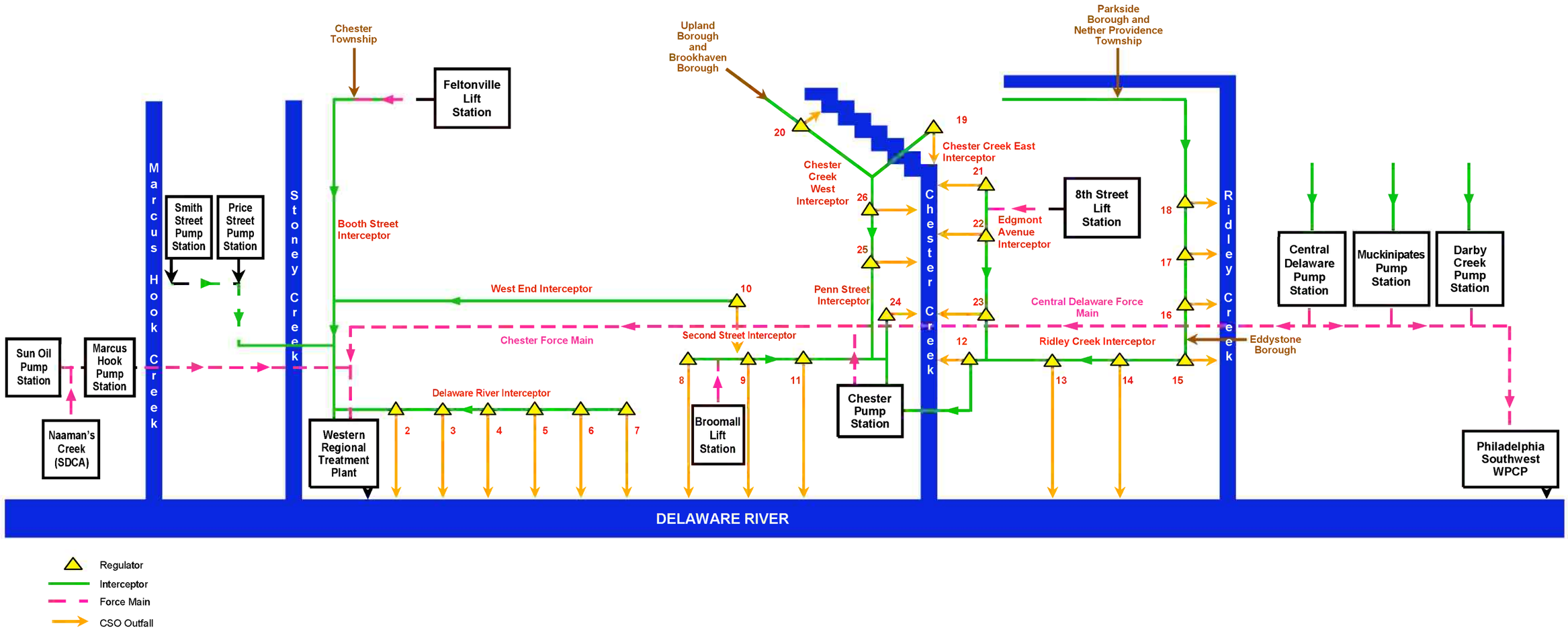
An additional three lift stations convey flow to the interceptor system and three privately owned pump stations discharge directly to the Chester force main. The three lift stations are the following:

- Broomall Street Pump Station (discharges into Second Street Interceptor).
- 8th Street Pump Station (discharges into Edgmont Avenue Interceptor).
- Feltonville Pump Station (discharges into Booth Street Interceptor).

The three privately-owned pump stations, which discharge to the Chester force main, are the following:

- KCPS – Kimberly Clark Pump Station (16.5 MGD capacity).
- SOPS – Sun Oil Pump Station (12 MGD-capacity).
- MHPS – Marcus Hook Pump Station (2.8 MGD capacity).

A schematic of DELCORA's pressure force main system is presented in Figure 3-2. Figure 3-2 includes representations of inflows from small local authorities such as Trainer Borough's Smith Street and Price Street pump stations and SDCA. SDCA owns and operates a sanitary sewer collection system and two pump stations: Beech Street and Naaman's Creek. Most sewage collected by SDCA is conveyed to the City of Wilmington's 90-MGD treatment plant via existing intermunicipal agreement with New Castle County, Delaware. However, wastewater pumped by Naaman's Creek Pump Station is conveyed to DELCORA via a tie in to the Sun Oil/Marcus Hook force main. This connection is shown on Figure 3-2. Also, a SDCA feasibility study discussed the upgrades needed to redirect discharge from the Beech Street Pump Station to DELCORA (Catania, 1998).



05P-0031-3

FIGURE 3-2 SCHEMATIC OF COMBINED SEWER SYSTEM, PUMP STATIONS, AND FORCE MAINS

A hydraulic analysis conducted for the portion of DELCORA's collection system that conveys flows to the WRTP is described in detail in Section 3.2.2. This collection system includes the 10 interceptors listed previously as well as the CPS and Chester force main. Other pump stations that contribute flow to the WRTP via direct connections with the Chester force main were not directly evaluated, but these flow contributions were included in the analysis of the Chester force main. In conducting the analysis, the gravity interceptor and force main subsystems were evaluated independently because they discharge to the WRTP through separate connections and operate independently of one another.

The gravity interceptor subsystem conveys flows to pump station EPS-1 at the WRTP and consists of the Booth Street, West End, and Delaware River Interceptors. The West End interceptor is at the most upstream end of this subsystem. The Booth Street Interceptor contributes flows to the West End Interceptor near its downstream end prior to connection with the Delaware River Interceptor. All flow conveyed by this subsystem is discharged to pump station EPS-1 via the Delaware River Interceptor.

The force main subsystem conveys flows to the WRTP via the Chester force main and consists of the Ridley Creek, Edgmont Avenue, Penn Street, Chester Creek East, Chester Creek West, and Second Street Interceptors as well as the Dock Street Extension and CPS. There are several branches of this subsystem that contribute flow to either the Ridley Creek or Second Street Interceptor, both of which convey flows to the wet well at the CPS. The Edgmont Avenue Interceptor contributes flow to the Ridley Creek Interceptor near its downstream end. At the downstream end of the Ridley Creek Interceptor is the Chester River siphon, which conveys flows directly to CPS. Near the upstream end of the Ridley Creek Interceptor is the Ridley Creek siphon, which conveys flows under Ridley Creek. The other interceptors contribute flow to the Second Street Interceptor. The Chester Creek East and Chester Creek West Interceptors intersect at the upstream end of the Penn Street Interceptor, which then conveys flows to the Second Street Interceptor. The Dock Street extension also contributes flows to the Second Street Interceptor.

3.1.2.1 Trainer Borough

Historically, Trainer Borough owned and maintained a collection system that discharges into DELCORA's West End Interceptor. DELCORA took over the Trainer Borough collection system, consisting of the Smith Street and the Price Street Pump Stations and associated force

mains. The Smith Street force main has failed in the past and the Price Street pump station and force main have inadequate capacity to convey peak flows. DELCORA has entered into a consent decree with PADEP to replace the Price Street pump station and all force mains in the Trainer Borough collection system. Alternatives to upgrade the system are presented in Section 5 of this report. The Trainer Borough collection system is included in Figure 3-2.

3.2 DESCRIPTION OF LIMITATIONS WITH EXISTING DELCORA FACILITIES

3.2.1 WRTP

The WRTP is currently permitted to discharge 44 MGD to the Delaware River under NPDES permit number PA 0027103. The focus of this *Act 537 Plan Update* is to support a re-rate of the WRTP to discharge 50 MGD. DELCORA has demonstrated that the WRTP facility is physically capable of receiving and treating 50 MGD of wastewater. DELCORA prepared and submitted to PADEP a report, dated February 14, 2003, demonstrating the WRTP's physical capability to support a re-rate to 50 MGD. In a letter dated 21 August 2003, PADEP agreed with the assessment. Refer to Appendix A for the referenced correspondence with PADEP.

To optimize the operation of the WRTP, DELCORA identifies needed repairs and upgrades through its ongoing operations and maintenance program. Scheduled upgrades to the WRTP are listed in Section 3.3.1.

3.2.2 Collection System - Hydraulic Evaluation

A hydraulic evaluation of DELCORA's collection system was performed to assess the adequacy of the system's existing capacity to support a re-rate of the WRTP from 44 to 50 MGD, and, if necessary, to identify any limitations within the system. The collection system was described in Section 3.1.2. A computer-aided hydraulic model of the system was developed using data provided by DELCORA to simulate hydraulic conditions of the collection system.

3.2.2.1 Collection System Modeling Approach

A computer model of the DELCORA collection system was developed using the commercially available computer software program, SewerCAD stand-alone version 5.5, developed by Haestad Methods, Inc. SewerCAD is specifically designed to analyze collection systems and was used to

simulate hydraulic conditions in the DELCORA collection system. SewerCAD accommodates both gravity and pressure flow through pipe networks, pump stations, and force mains.

As described in Section 3.1.2, the collection system is comprised of two subsystems that operate independently of one another and were, therefore, modeled and evaluated separately. The first system model, the southwest model, consists of the interceptors that convey flows to EPS-1 at the WRTP. The second system model, the northeast model, consists of the interceptors that convey flows to CPS, which pumps flows through Chester force main to the WRTP.

A majority of the input data for the SewerCAD model came from the Stormwater Management Model (SWMM) (USEPA, version 4.4h, February, 2001) used to model the interceptor system for CSO events. Data for pipe length, diameter, pipe invert, and rim elevation for the interceptor pipes were taken from the SWMM model.

Using SewerCAD, the flow through each pipe segment was calculated and compared to the total capacity of each pipe segment, which was calculated using the physical characteristics as input by the user. A pipe was considered at capacity when flowing full under gravity conditions. To calculate gravity flow in a DELCORA interceptor, a flow profile was determined in terms of energy. The energy at any point in the system was expressed in terms of pressure head, velocity head, and elevation head, with the total head being the sum of these three components. The hydraulic gradeline is the sum of the pressure and elevation heads. The energy gradeline is the sum of the pressure, elevation, and velocity heads. In the case of gravity flow, the hydraulic and energy gradelines are equal and define the water surface in the pipe. Pipes were considered surcharged when the elevation of the hydraulic gradeline was above the crown of the pipe. Any limitations in the system were identified from the results of this analysis. The model simulations were run using design conditions (i.e., design values for Manning's roughness coefficient) and the model does not account for aging processes such as siltation of the pipes. The Collection System Modeling Report is included in Appendix B of this document. The SewerCAD model results can be found in Appendix C.

3.2.2.2 Flow Metering Effort and Flow Data

Flow data for the CPS and contributing flows from pump stations connecting to the Chester force main were obtained from pump station flow meter records or assumed using allowable flows.

Flow data for the gravity interceptors were collected by a series of 31 temporary metering stations that were installed, monitored, and removed by WESTON and its subcontractor, ADS Environmental Services. Flow meters were placed at strategic locations throughout the interceptor system, with at least one flow meter on every interceptor except for the Dock Street Extension. Although three flow meters were planned for the Delaware River Interceptor, surcharging along this interceptor prohibited one meter from being installed. The locations of the temporary meters are shown in Figure 3-3.

Flows were measured continuously at all the metering stations and measurements were recorded every 5 minutes. ADS collected the data recorded by each flow meter for approximately 3 months. The final data submittal provided by ADS were used to calculate a dry weather average flow value as input for the model.

To calculate the dry weather average flow for each meter, a period of dry weather was identified during the meter data collection timeframe. There were only two data points of trace rainfall during the time from 17 January 2005 to 13 February 2005. Therefore, the 5-minute flow data recorded during those 27 days was averaged for the entire time period to obtain a value for the dry weather average flow. The flow meters on the Delaware River Interceptor were installed several months after the rest of the meters. Therefore, the dry weather time periods for meters 02 and 03 are 11 to 26 June 2005 and 2 to 19 May 2005, respectively.

To calculate a peaking factor for maximum daily dry weather flow, the maximum flow was identified during the same time period that was used to calculate the dry weather average flow. The maximum flow was then divided by the average flow to determine the peaking factor in the system at each meter.

Flows were input into the hydraulic model of the DELCORA system at the manhole locations where they tie into the interceptors. These manholes were determined using flow input locations identified on geographic information system (GIS) system maps and in the SWMM model. The flow measured by a particular meter was input upstream of the flow meter. If more than one connection point to the interceptor exists between two flow meter locations, the measured flow was proportioned based on the estimated dry weather flows of the drainage basins contributing flow to each connection point, as defined in the Report of CSO Modeling for 2004 (WESTON, 2005). The drainage area to each regulator and/or sewer lateral was delineated by WESTON

ASTON TOWNSHIP

BROOKHAVEN BOROUGH

NEITHER PROVIDENCE TOWNSHIP

PARKSIDE BOROUGH

UPPER CHICHESTER TOWNSHIP

CHESTER TOWNSHIP

CHESTER CREEK

UPLAND BOROUGH

RIDLEY TOWNSHIP

RIDLEY CREEK

TRAINER BOROUGH

CHESTER CITY

EDDYSTONE BOROUGH

DELAWARE RIVER

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

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LEGEND

- Manholes
- 2nd Street Interceptor
- Collector
- Booth Street Interceptor
- Chester Creek East Interceptor
- Chester Creek West Interceptor
- Delaware River Interceptor
- Edgmont Ave Interceptor
- Penn Street Interceptor
- Ridley Creek Interceptor
- Stony Creek Collector
- West End Interceptor
- Flow Meter Locations
- CSO Regulators
- Pump Stations
- Streams
- Municipal Boundaries

N

Location Map

0 750 1,500 3,000

Feet

WESTON SOLUTIONS

DELCORA

Delaware County Regional Water Quality Control Authority (DELCORA)

Long Term CSO Control Plan
City of Chester Combined Sewer System

Figure 3-3
Location of Temporary Meters

based upon sewer maps and inlet maps. If there is more than one flow meter along an interceptor, the incremental flow added to the section of interceptor between two flow meters was considered. For maximum flow, the peaking factor for each meter was applied to the flow associated with that meter to try to account for variations of peak flow within the system.

In addition to flow connections with the interceptors, there are three direct connections to the Chester force main from the following pump stations: KCPS, CDPS, and SOPS/MHPS. Just downstream of the CPS, flows from the KCPS tie in to the Chester force main. Further downstream, flows from CDPS tie in to the force main. The third tie in contributes flows to the force main from SOPS and MHPS.

3.2.2.3 System Analysis

The SewerCAD model was developed using the best available input data. The model results are estimates that were used to verify known limitations in the collection system and to indicate potential limitations to convey future flows. The model was also used to size upgrades to identified components to correct potential future limitations within the system. The hydraulic model was run under steady state conditions for current average daily flow and maximum daily flow. Future condition analyses are discussed in Section 4.4.5.1. The following results were generated:

- The model indicates that the Chester force main conveys flow at velocities below 5 feet per second. This is well within the recommended operating range of 2 to 10 feet per second, and suggests that the Chester force main has additional capacity to accept flow. These results are consistent with what would be expected based on analysis of the system head vs. discharge curve.
- The model indicates that the gravity interceptor system is not surcharged under average daily flow conditions. The following is a list of locations in the gravity interceptor system where the pipe is flowing 50% full or greater:
  - Delaware Avenue Interceptor between MH 01-006 and MH 01-010, most likely due to a slightly adverse slope condition.
  - Ridley Creek Interceptor between MH 07-066 and MH 07-083, most likely due to a flat slope and small diameter pipe(less than 30-inch); between MH 07-031 and MH 04-042, most likely due to flat slope conditions; between MH 07-022 and MH 04-025, most likely due to adverse slope conditions; and between MH 07-002 and MH 04-005, most likely due to adverse slope conditions.

- Second Street Interceptor between MH 04-015 and MH 04-018, most likely due to adverse slope conditions.

- Edgmont Avenue Interceptor at MH 06-010, most likely due to an adverse slope condition.

- Chester Creek West Interceptor between MH 05-034 and MH 05-034-001, most likely due to diameter of pipe (12-inch).

- Chester Creek East Interceptor between MH 05-020-006 and MH 05-020-010, most likely due to diameter of pipe (12-inch); and between MH 05-020-003 and MH 05-020A, most likely due to adverse slope conditions.

- The model indicates that the gravity interceptor system does surcharge under maximum flow conditions. The following is a list of locations in the gravity interceptor system where the pipe is flowing 75% full or greater:

  - Delaware Avenue Interceptor between MH 01-006 and MH 01-010 is flowing greater than 75% full, most likely due to a slightly adverse slope condition.

  - Ridley Creek Interceptor between MH 07-071 and MH 07-083 is flowing under pressure, most likely due to a flat slope and small-diameter pipe (less than 30-inch); between MH 07-022 and MH 04-025 is flowing greater than 75% full, most likely due to adverse slope conditions; and between MH 07-002 and MH 04-005 is flowing greater than 75% full, most likely due to adverse slope conditions.

  - Second Street Interceptor between MH 04-014 and MH 04-020 is flowing greater than 75% full, most likely due to adverse slope conditions.

  - Chester Creek West Interceptor between MH 05-034 and MH 05-034-002 is flowing 100% full, most likely due to diameter of pipe (12-inch).

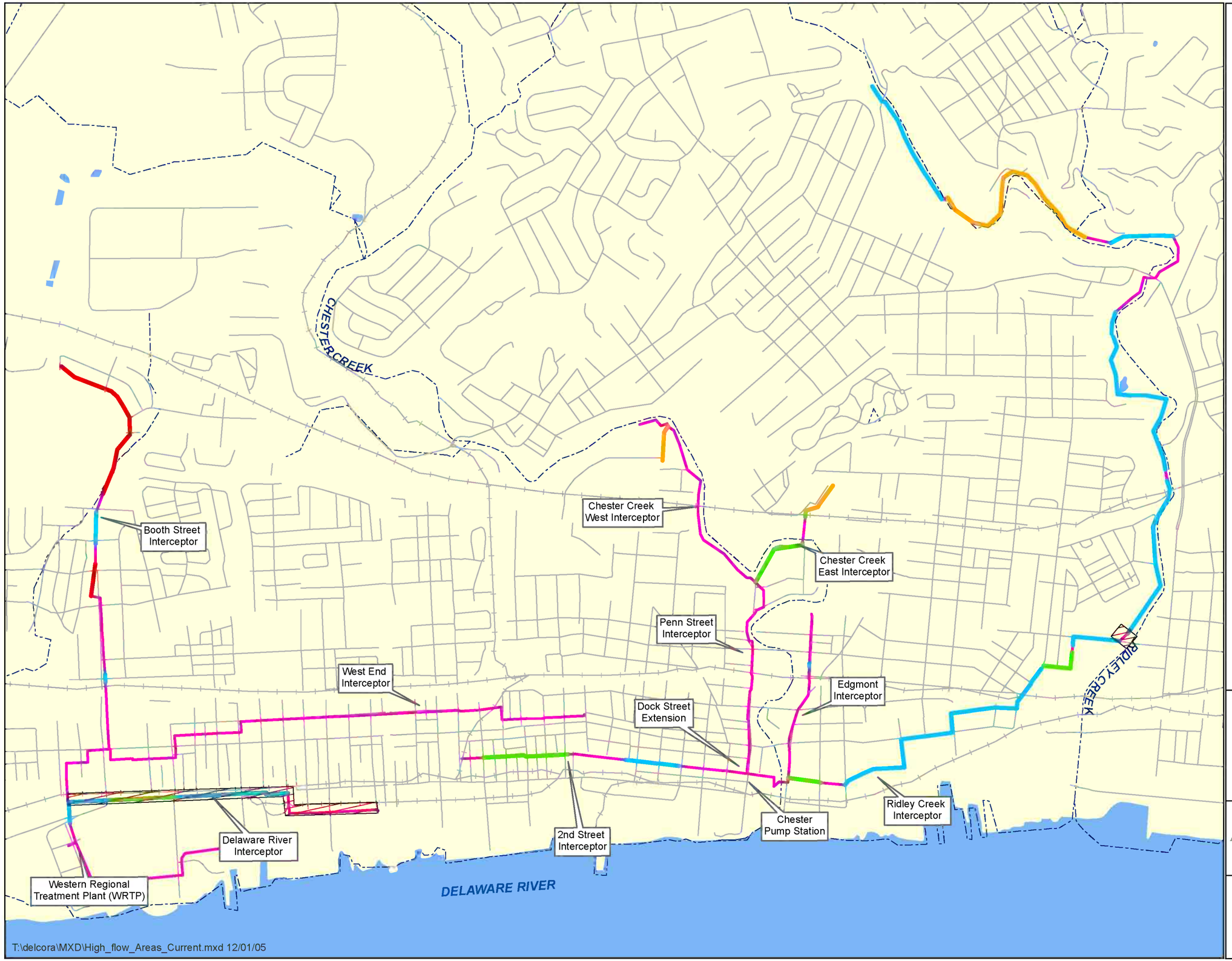
  - Chester Creek East Interceptor between MH 05-020-006 and MH 05-020-010 is flowing under pressure, most likely due to diameter of pipe (12-inch); and between MH 05-020-003 and MH 05-020A is flowing greater than 75% full, most likely due to adverse slope conditions.

A summary of areas of concern within the interceptors are identified in Table 3-2 and illustrated in Figure 3-4. For each scenario, sections of pipe are identified as flowing greater than 50 % full, greater than 75% full, 100% full, or are under pressure for both average daily flow and maximum flow conditions. SewerCAD model outputs are provided in Appendix C. Alternatives developed to minimize or prevent surcharging of all segments of the system are presented in Section 5 of this *Act 537 Plan Update*.

Table 3-2
Summary of Model Results for Current Conditions

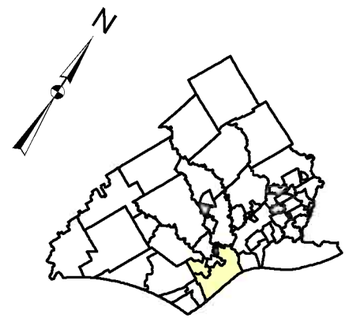
Interceptor Name	From Manhole	To Manhole	Scenario		Manholes Surcharging at Maximum Conditions
			Average Flow	Maximum Flow	
Delaware River	01-010	01-016	-	≥ 50% ≤ 75%	none
	01-006	01-010	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
	01-003	01-006	-	≥ 50% ≤ 75%	
Booth Street	02-007-028	02-007-027-006	-	-	none
	02-007-021	02-007-028	-	-	
	02-007-017	02-007-019	-	≥ 50% ≤ 75%	
	02-007-014	02-007-016	-	-	
	02-007-004	02-007-005	-	≥ 50% ≤ 75%	
Second Street	04-014	04-020	≥ 50% ≤ 75%	≥ 75% ≤ 100%	none
	04-006	04-010	-	≥ 50% ≤ 75%	
Chester Creek West	05-034	05-034-002	≥ 50% ≤ 75%	100%	none
Chester Creek East	05-020-007	05-020-010	G.T. 75%	Pressure Flow	05-020-007 through 010
	05-020-006	05-020-007	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
	05-020A	05-020-003	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
Edgmont Avenue	at 06-010		≥ 50% ≤ 75%	≥ 50% ≤ 75%	none
Ridley Creek	07-084	07-092	-	≥ 50% ≤ 75%	07-072 through 083
	07-071	07-083	≥ 75% ≤ 100%	Pressure Flow	
	07-066	07-070	≥ 50% ≤ 75%	≥ 50% ≤ 75%	
	07-043	07-059	-	≥ 50% ≤ 75%	
	07-031	07-042	≥ 50% ≤ 75%	≥ 50% ≤ 75%	
	07-026	07-030	-	≥ 50% ≤ 75%	
	07-022	07-025	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
	07-006	07-021	-	≥ 50% ≤ 75%	
	07-002	07-005	≥ 50% ≤ 75%	≥ 75% ≤ 100%	

≥ = pipe is flowing greater than or equal to
≤ = pipe is flowing less than or equal to
- = pipe is flowing less than 50 % full



LEGEND

- Pipe Under Pressure Flow
- Pipe Flowing 100% Full
- Pipe Flowing Greater than 75% Full
- Pipe Flowing Greater than 50% Full
- Interceptors
- Observed Flowing Full



Location Map

0 750 1,500 3,000

Feet

WESTON SOLUTIONS

DELCORA

ACT 537: SEWAGE FACILITIES PLAN UPDATE

Figure 3-4
Areas of High Flow During Current Maximum Flow Conditions

Hydraulic modeling of the combined sewer system's response to storm events is performed on a regular basis by DELCORA using SWMM version 4.4h. SWMM modeling indicates under what conditions the combined sewer regulators open and flow is discharged from the combined sewer outfalls into the Delaware River. DELCORA's Long-Term CSO Control Plan (April, 1999) describes the management practices employed to minimize CSO impacts and guide planning initiatives, such as development of system upgrade alternatives like those described in Chapter 5 of this plan.

3.2.3 Observed Problem Areas

DELCORA has provided descriptions of observed problem areas in addition to the segments of interceptors that the SewerCAD model simulated as not having sufficient capacity for existing flows. These areas include the following:

- Ridley siphon box to manhole 48 has experienced heavy grit over the years.
- There is no access to the segment below Ridley siphon box (next to Ventura Apts. on 22nd Street).
- Surcharging conditions reported for manholes 30 and 31 on Ridley Creek Interceptor.
- Delaware River Interceptor surcharging remains a problem from Clayton Street towards Booth Street. The new junction manholes should reduce the occurrences of surcharging.

3.3 PLANNED IMPROVEMENTS TO DELCORA FACILITIES

3.3.1 Scheduled Upgrades to WRTP

It is DELCORA's intention to maximize the utilization of the WRTP. Upgrades currently underway or scheduled at the WRTP include:

- Modifications to the sludge delivery and mixing system (to be completed by 2007).
- Rehabilitation of one belt press (construction to be completed in 2006).
- Phase II of the automation of process SCADA (to be completed in 2006).
- Pump station (EPS-1) force main replacement (construction to begin in 2006).
- Plant recycle flow pump station (currently unfunded).

3.3.2 Commissioned Studies of Interceptors

- Replacement/rehabilitation of manhole at Front and Clayton Streets on Delaware River Interceptor (draft feasibility study complete, final study to be completed in 2006).
- Replacement/rehabilitation of Chester Creek West Interceptor I-95 crossing. The feasibility study is in progress and is projected to be completed in 2006.
- Investigation of siphons (study to be completed in 2006).

3.4 DELCORA'S SLUDGE AND SEPTAGE MANAGEMENT

3.4.1 Sludge/Biosolids Generation

Activated sludge is removed from the system based on flow and solids concentration. The secondary activated sludge is thickened in a dissolved air flotation system prior to dewatering. The combined primary and secondary sludge is pumped to the filtration building at about 3 to 5% solids. The sludge can be directed to one, two, or all three belt filter presses. Sludge cake from the belt presses is conveyed to an incinerator. The ash is collected at the bottom of the incinerator and transported by air to two storage silos. The incinerator is normally operated 24-hours-a-day, seven-days-a-week. Sludge reduction by incineration is about 75%. The ash is permitted for landfill disposal in the State of Delaware and all ash generated is disposed of there.

An average of 40.2 dry tons of sludge was incinerated per day in 2005 at DELCORA's WRTP. There are two incinerator units at the WRTP. Each incinerator unit is permitted to burn 48 tons per day for a total of 96 tons per day for the facility.

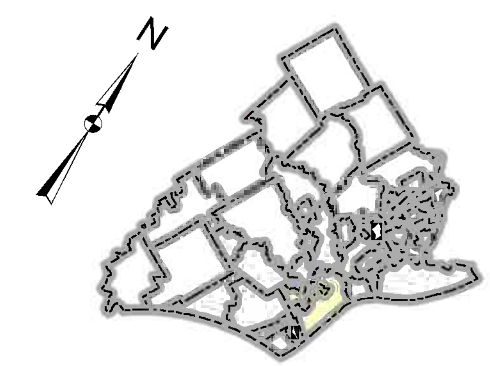
3.5 TRAINER BOROUGH

DELCORA assumed ownership of the Trainer Borough wastewater collection system on 15 August 2005. As part of the transfer in ownership of the collection system from the Borough of Trainer, DELCORA is responsible for complying with the Consent Order and Agreement between PADEP and the Borough of Trainer, signed 14 June 2005. The Trainer Borough wastewater collection system is shown in Figure 3-5.

Required elements (Milestone Events) in the Consent Order include an assessment of the sanitary sewer system, performance of system rehabilitation where needed, upgrading the pumping capacity of the Price Street Pump Station, and fully replacing the force main. Alternatives to address these requirements are presented in Chapter 5 of this *Act 537 Plan Update*.

LEGEND

- Western Regional Treament Plant
- Pump Station
- Force Main
- Interceptor
- Observed Flowing Full



Location Map

0 500 1,000

Feet

ACT 537: SEWAGE FACILITIES PLAN UPDATE

Figure 3-5
Trainer Borough
Wastewater Collection System

4. FUTURE GROWTH AND LAND DEVELOPMENT

4.1 INTRODUCTION

As noted in Section 1, this *Act 537 Plan Update* follows a long history of wastewater facilities planning in Delaware County. Planning efforts have continued since each of Delaware County's 49 municipalities adopted the *Delaware County Sewerage Facilities Plan* as their Official Act 537 Sewage Facilities Plan in 1971. Land use, water supply, and stormwater plans with potential for impacting wastewater planning have also been prepared over the last 35 years, and municipalities have enacted zoning and subdivision/land development ordinances to carry out local planning objectives.

The purpose of this chapter is to identify, describe, and compare planning that has taken place in municipalities within the WRTP Planning Area. An implementation progress report, comparison of various planning efforts to determine consistency or conflict, and a definition of planned development and planning needs within the WRTP Planning Area are included in this section.

4.2 LAND USE PLANNING AND REGULATION

To ensure proper development and alleviate growth pressures, municipalities are able to adopt planning documents pursuant to the Municipalities Planning Code (MPC), Act 247 of 1968, as amended. These planning documents include comprehensive land use plans, zoning ordinances, and subdivision/land development regulations. It was important to examine these documents while preparing this *Act 537 Plan Update* to establish relationships between the existing and proposed land uses within each municipality with the need for sewers in the WRTP service area and also, potential service areas.

As previously discussed, Act 537 requires municipalities to adopt sewage facilities plans for the provision of adequate sewage facilities as well as to protect water supplies. These plans should allow for a variety of treatment techniques based upon their availability, efficiency, and cost. The task in this section is to analyze the correlation between documents adopted under Act 247 and Act 537.

4.2.1 Comprehensive Land Use Planning

4.2.1.1 County Planning

Act 247 requires all counties to prepare and adopt a comprehensive plan. Municipal comprehensive plans that are adopted must be generally consistent with adopted county plans. The existing unofficial Delaware County revised comprehensive plan, *Delaware County Land Use Plan 2000* (originally issued January 1976), was largely a compilation of municipal comprehensive plans. Therefore, the municipal plans are consistent with the Delaware County comprehensive plan.

Delaware County has officially adopted the policies section of the *Open Space, Parks, and Recreation Study* (1978), which was developed pursuant to the Delaware County Land Use Plan. As described in Section 1.3.1, DCPD is currently in the process of preparing a Delaware County comprehensive plan that will meet state requirements and provide the necessary guidance to County agencies and municipalities regarding future growth, development, and redevelopment in Delaware County. The plan will restate the objectives of maintaining the existing public sewer network and providing capacity for extension to areas in need of connection. The need for viable wastewater treatment alternatives in the developing parts of Delaware County will be emphasized. The plan will take into account that these goals should be approached while encouraging sustainable development practices and preserving and enhancing the environment.

4.2.1.2 Municipal Planning

All of the western Delaware County municipalities have adopted comprehensive plans. The land uses and densities recommended in these plans were based, to a great extent, on soil suitability for on-lot systems and the availability of public sewers. Plans prepared in the early 1970s tend to be consistent with Delaware County's 1971 Act 537 Plan, while some of the later plans either advocate additional sewerage studies or refer to studies already in progress.

All of the eastern Delaware County municipalities have adopted comprehensive plans. Several have recently undergone or are undergoing revision. Availability of sewer service, except to the extent that there is adequate capacity in the existing conveyance systems, is not a significant factor in determining growth or future zoning because most of the area in eastern Delaware County is serviced by the public collection system.

4.2.1.3 Municipal Zoning

In developing areas, municipal zoning has a great impact on density, ultimate build-out, and need for sewers to serve development that occurs in accordance with the zoning. Wastewater facilities needed to serve the various types of development depend on a number of factors in addition to zoning.

In developed areas, such as most of eastern Delaware County, zoning is not a driving force in sewage facilities decision-making since most of these areas are already publicly sewered. Therefore, any infill, redevelopment, or even new development in these municipalities is within a relatively short distance of a public sewer system and is expected to connect to the nearest system.

The majority of western Delaware County, however, is undergoing or has the potential for additional residential, commercial, and industrial development. This potential particularly applies to municipalities located in the northern and western part of western Delaware County, such as Edgmont, Newtown, and Thornbury Townships. In these municipalities, the availability of public sewers has a significant effect on development patterns.

4.2.1.4 Planning Documents

Most of the area currently served by the DELCORA WRTP is fully developed. In these areas, any development that may occur, may be considered infill or redevelopment. DCPD records indicate that all of the municipalities served by the DELCORA WRTP have comprehensive plans; however, many of the plans date back to the 1970s. These plans address issues of land planning; residential, commercial, industrial, and institutional development; transportation; community facilities and service; utilities; and environmental and economic resources. Most municipalities have zoning and land development ordinances, many of which were developed or revised in the 1990s.

For those municipalities within or potentially within (see Section 4.4) the WRTP service area which contain large remaining tracts of land available for development, a brief description of the zoning/build-out potential as well as the sewage facility-related zoning provisions of the municipalities is noted in the following paragraphs.

Bethel Township

Bethel Township's zoning code allows for a variety of land uses, including different density residential districts, light industrial districts, and commercial districts. Significant areas of land are assigned "tank" zoning and accommodate tank farms for local refineries. For any new construction, the Township requires 40,000-square foot (sq ft) lots in its R-1 district for those areas where public water and sewer are not available. When public utilities are available, the lot size can be decreased to 30,000 sq ft. High-density development lots range from 2,000 sq ft for townhouses to 4,000 sq ft for single-family semi-detached homes.

The subdivision and land development ordinance of 1977 requires developers to connect to public sewers, where available. For areas where public sewers are not available, the following methods are acceptable per the ordinance, listed in order of desirability: community sewer and treatment plant, capped sewers with temporary on-lot disposal systems (OLDS), on-lot facilities of various types, or other disposal methods. The ordinance also requires soil percolation tests to determine soil suitability for OLDS. All proposed connections to a public sewer system and OLDS must be certified by the Township.

The latest planning study for Bethel Township was completed in 1977. This study indicated the necessity of public sewers in all but low-density residential districts due to "unsatisfactory subsurface conditions." The study called for future land development to be coordinated with public sewer development. To minimize the Township's costs for sewers, the Future Land Use Plan chapter of the study suggests guiding development into patterns that can be most efficiently sewered. The plan also suggested tying any future sewers in some areas south of Naamans Creek Road to the New Castle County, Delaware, sewer system and sewers in the easternmost part of the Township to the sewer system in Upper Chichester.

Newtown Township

Newtown Township's zoning ordinance (Chapter 172 as amended September 9, 2002) allows for minimum lot sizes that range from 60,000 sq ft in the R-1 Residence District to 12 units per acre in the A-O Apartment Office District. Lots without public water are required to be a minimum of 12,000 sq ft. There are no requirements in the zoning ordinance that address minimum lot sizes

for developments that are not served by public sewer. Non-residential districts permitted by the ordinance include office, commercial, special use, and industrial.

Newtown Township's subdivision ordinance of 1995 (Chapter 148 as amended September 25, 2000) requires lots where both water and sanitary sewage disposal are provided by OLDS to have a minimum area of 30,000 sq ft and a minimum width, measured at the building line, of 150 ft. The ordinance requires each property to be connected "to a public sewer system if accessible by gravity." In areas where sewers are not currently available, but are probable within 10 years, new developments must include capped sewers. On-site sewer systems are permitted in conformance with State and Township regulations where they can be accommodated safely. Soil percolation tests are required in these cases. The ordinance includes a general statement that the proposed method of sewage disposal shall be in accordance with the Township's Act 537 Plan.

The Newtown Township Comprehensive Plan was prepared in 2001. The plan notes soil limitations for subsurface disposal in western and northern portions of the Township. Public sewers in the township convey wastewater to the Radnor-Haverford-Marple Sewer Authority and the Darby Creek Joint Authority. The sewer mains responsible for this transport reached their hydraulic capacity in the mid-1990s. Despite that, some development has proceeded in the northern and southern portions of the township employing both individual and community on-lot wastewater disposal methods. In recent years new developments increasingly use small package plants for their wastewater needs. This trend allows planning for development in areas where public sewer is not available and soils are not suitable for subsurface disposal. The Comprehensive Plan recommends exploring centralized sewer options, such as extension of the CDCA's Crum Creek Interceptor into the Township. It also recommends planning a limited number of package plants for the future. Careful monitoring of subsurface systems is necessary with provision for possible connections to package plants and a central sewer in case of future failures.

Aqua America is currently finalizing an agreement to construct a 350,000-gallon per day waste water treatment plant on the Garrett-Williamson tract in Newtown Township. This plant is planned to discharge treated effluent by spray or drip irrigation to a 100-acre portion of the tract with another 15 acres potentially available from an adjoining property owner. This plant would

collect waste water from potential development on the DuPont tract and the Episcopal Academy tract as well as approximately 113,500 gallons from Edgmont Township.

The Newtown Township Act 537 Plan (Peter Krasas Jr. & Associates, May 23, 2002) states that utilization of CDCA sewage facilities will eliminate the need for the existing 85,000-gallon-per-day (GPD) stream discharge sewage treatment plant along with the future need to expand this plant to 150,000 GPD. Connecting to the CDCA Interceptor will also make it possible to eliminate the existing Springton Pointe Estates Sewage Treatment Plant (STP) that serves 118 existing homes.

Upper Providence

Minimum residential lot sizes specified in Upper Providence Township's zoning ordinance range from 43,560 sq ft in the R-1 Residence District to 5,000 sq ft for single family residences and 2,000 sq ft for apartments in the R-6 Residence District. Lot sizes are not predicated on the availability of public water or sewer. Non-residential districts include business, limited industrial, planned office campus, recreational and open space.

Upper Providence Township's subdivision ordinance requires each property to be "connected to a public sewer system, if accessible." When sewers are not available, but are planned for extension, the developer is required to install capped sewer laterals.

The Upper Providence Township Comprehensive Plan was developed in 1989. The plan recommended regulation of the intensity of new development in order not to exceed the capacity of sewer facilities. The plan also drew attention to OLDS and to the necessity of properly designing new subsurface discharge systems and addressing the problems of existing systems. The plan suggested investigating opportunities of extending sewer lines to cluster tracts in the Ridley Creek watershed and the possibility of using the Crum Creek Interceptor.

The Upper Providence Township Act 537 Plan (Kelly Engineers, 18 February 2002) recommends that Upper Providence Township pursue membership in the CDCA.

Major Inconsistencies

Inconsistencies for municipalities located within or adjacent to the WRTP service areas or potential service areas are noted in Table 4-1, Zoning Ordinance Review.

Table 4-1

Zoning Ordinance Review

Municipality	Date (Status)	Summary	Minimum Lot size dependent on sewerage?	Inconsistencies
Bethel Township	Subdivision and Land Development Regulations – 1977 1972 Planning Study Zoning Ordinance – June 12, 2001	S&LD Regulations contain requirement for installation of capped sewers in all cases where sanitary sewers are not yet available. Requires connection to sewers when they are available. Zoning Ordinance says that the Township Engineer must approve all methods of sewage disposal. Mobile home parks, PRDs, C-1, and R-4 are required to be served by public sewer.	In R-1 and C-1, minimum lot size of 40,000 sq ft is reduced to 30,000 sq ft with public sewer and water.	
Edgmont Township	Comprehensive Plan – September 20, 2000 Zoning Ordinance – December 17, 1997 Subdivision and Land Development Ordinance – December 17, 1997	S&LD Regulations contain requirement for installation of capped sewers in all cases where sanitary sewers are not yet available. Requires connection to sewers when they are available. Zoning requires PRDs to be served by public sewer.	No	The Comprehensive Plan recommends the continued use of the existing community STPs. Recommends evaluation of providing Community STPs to areas of future development as part of the Act 537 Plan Update.
Newtown Township	Subdivision and Land Development Ordinance – 1995, as amended September 25, 2000 Comprehensive Plan – October 25, 2001 Zoning Ordinance – as amended September 9, 2003	SL&D Ordinance requires new development to connect to public sewer if accessible. OLDS have to conform to state requirements. Capped sewer systems to the right-of-way line are required if trunk line extension is anticipated within 10 years. Zoning Ordinance requires R-4 townhouse developments and conditional uses under special use districts to be served by public sewer and water.	No	Comprehensive Plan recommends oversight of the increasing trend toward package plants and that the Act 537 Plan Update include evaluation of OLDS failures due to age.
Upper Providence Township	Planning and Zoning Code Ordinance 198 – December 14, 1989 Comprehensive Plan – October, 1989	Requires connection to public sewer if accessible. Requires installation of sewers in conformance with Act 537 Plan. Ch. 1052 regulates community on-lot systems. Comp Plan notes problems with many failing OLDS.	No	

4.3 OTHER ENVIRONMENTAL PLANNING

4.3.1 Water Quality Requirements

Pennsylvania regulations specifically address water quality standards in 25 PA Code § 93. Chapter 93 sets statewide designated uses for all surface waters. Specific uses for water bodies in Delaware County are shown in Table 4-2.

Chapter 93 water quality criteria are associated with the statewide water uses and apply to all surface waters unless otherwise indicated. The criteria specify such parameters as pH, temperature, dissolved oxygen, color, bacteria count, nutrients, priority pollutants, and others.

Clean Water Act Section 305(b) requires a report on all impaired waters of the Commonwealth. Section 303(d) further evaluates these findings to determine which waters still would not support specified uses even after the appropriate required water pollution technology has been applied. Section 303(d) also establishes the total maximum daily load (TMDL) program. In 1997, EPA and PADEP agreed to a 12-year schedule to develop TMDLs for 575 impaired 303(d) list segments. In 1998, 403 more water bodies were added to the 303(d) list.

None of the streams in Delaware County have approved TMDLs as of 2006. The 2006 Pennsylvania Integrated Water Quality monitoring Report 303(d) list includes segments of Chester Creek and the East and West Branches of Chester Creek that are anticipated to have TMDL requirements promulgated in 2007. Section 303(d) streams in western Delaware County are presented in Table 4-2. The anticipated TMDL dates for streams within the study area are included in Table 4-2.

Table 4-2
303(d) Listed Streams in Delaware County

Stream	Protected Water Uses	Drainage Area (sq mi)	Miles Impaired	Causes	Sources of Impairment	Anticipated TMDL Date	Comments
2-Darby Creek	CWF, MF, TSF	77.2	10.13 Main stem; 3.55, 4 UNTs	Unknown/Metals	Urban runoff/ storm sewers	2015	*CWF, MF above Rt. 3, TSF, MF below Rt. 3*
3-Little Darby Creek	CWF, MF	3.61	1.73	Unknown	Urban runoff/storm sewers	2015	
4-Langford Run	WWF, MF	1.41	1.73	Unknown/Metals	Urban runoff/storm sewers	2015	
3-Whetstone Run & one UNT	WWF, MF	1.1	0.94 Main stem; 0.26, UNT	Metals	Urban runoff/storm sewers	2015	
4-Indian Creek	WWF, MF	3.96	0.66	Unknown/Siltation	Urban runoff/storm sewers	2015	
5-East Branch Indian Creek	WWF, MF	1.75	2.61	Unknown/Siltation	Urban runoff/storm sewers Municipal Point Source	2015	
5-West Branch Indian Creek	WWF, MF	1.75	2.82	Siltation	Urban runoff/storm sewers Municipal point Source	2015	
3-Hermesprota Creek	WWF, MF	1.83	2.15	Unknown/Metals	Urban runoff/storm sewers	2007, Metals 2015, Siltation	
3-Muckinipates Creek	WWF, MF	4.29	7.34	Unknown/Metals	Urban runoff/storm sewers	2015	
3-Stony Creek & one UNT	WWF, MF	2.97	5.0 Main Stem, 1.16, 1 UNT	Unknown/Metals	Urban runoff/storm sewers	2015	
2-Crum Creek	HQ-CWF, CWF, WWF	38.3	7.68 Main stem; 3.30, 3 UNTs	Thermal Modifications/Siltation	Urban runoff/storm sewers	2011, Thermal 2015, Siltation	*HQ-CWF upper basin in Chester Co., WWF below Springton Res.*

Table 4-2 (Continued)
303(d) Listed Streams in Delaware County

Stream	Protected Water Uses	Drainage Area (sq mi)	Miles Impaired	Causes	Sources of Impairment	Anticipated TMDL Date	Comments
3-Trout Run & 4 UNTs	WWF	2.79	3.27 Main stem; 2.04, 4 UNTs	Unknown/Siltation	Urban runoff/storm sewers	2017	
3-Hotland Run	WWF	1.01	0.33 Main stem; 0.9, 1 UNT	Unknown/Siltation	Urban runoff/storm sewers	2017	
3-Dicks Run	WWF	0.9	1.93	Unknown/Siltation	Urban runoff/storm sewers	2015	
3-Little Crum Creek	WWF	3.3	3.77	Unknown/Siltation	Urban runoff/storm sewers	2015	
2-Ridley Creek - 12 UNTs	HQ-TSF, TSF, WWF, MF	37.9	8.7, 12 UNTs	Unknown/Siltation	Urban runoff/storm sewers	2015	*HQ-TSF upper basin above Media Water Intake*
2-Chester Creek	HQ-CWF, CWF, TSF, MF, WWF	66.4	19.88 Main stem; 5.74, 5 UNTs	Priority organics/Siltation	Flow regulation/ modification; Municipal point source; Industrial Point Source; Urban runoff/storm sewers	2007, Priority Organics 2015, Siltation 2019, Pathogens	*CWF, TSF above Dutton Mill Rd., WWF below Dutton Mill Rd.*
3-East Branch Chester Creek	TSF	35.6	0.8	Unknown	Industrial Point Source	2007	
3-West Branch Chester Creek	TSF, MF	19.1	1.5, UNT	Unknown	Municipal Point Source	2007	
2-Marcus Hook Creek & 5 UNTs	WWF	5.22	6.25 Main stem; 4.31, 5 UNTs	Land disposal-metals; siltation	Urban runoff/storm sewers Land Disposal	2015	

4.3.2 Pennsylvania State Water Plan

The Pennsylvania State Water Plan was originally developed in the 1970s and divided the state's major river basins into 20 smaller units (subbasins) for planning purposes. Most of these subbasins were further divided into watershed areas that range in size from 100 to 1,000 square miles. Western Delaware County is located in Subbasin 3 (Lower Delaware River) Watershed Area G (Darby-Crum Creeks) covers most of the area, while a small portion of the County bordering Chester County falls into Watershed Area H (Brandywine Creek).

The Pennsylvania State Water Plan for Subbasin 3 was published in 1983. It addressed a general understanding of water resources and examined problems and viable solutions. The plan identified high water usage in the area and noted rapid population growth in Delaware County. The growing problem of community development in floodplains was also addressed. Adverse effects of municipal and industrial discharges as well as erosion and sedimentation on surface water quality were discussed. Chester Creek and Ridley Creek were specifically identified as those affected by inadequately treated waste discharges and malfunctioning septic tanks. Water quality in Crum Creek and the upper reaches of Darby Creek was rated good and excellent, respectively, while the lower reaches of Darby Creek received only poor marks. Elevated nutrient levels from agricultural runoff affected water quality in Red Clay Creek and White Clay Creek while water quality in the upper reaches of the East and West Branches of Brandywine Creek was rated as good. The plan identified upgrades of municipal wastewater treatment facilities as one of the major solutions to water quality problems in these watersheds.

These issues are still relevant to western Delaware County 20 years later. Positive changes since 1983 include major improvements to existing treatment facilities and construction of new ones, more efficient OLDS, and better control of erosion and sedimentation and nonpoint pollution runoff. However, these positive effects were offset by increasing volumes of wastewater and urban runoff due to population growth, aging and failing OLDS, and Inflow and Infiltration (I&I) in municipal sewers resulting in overflows and capacity problems for treatment facilities.

The Darby-Crum Creeks watershed, designated as Watershed G, has an approximate drainage area of 231 square miles and also includes Ridley Creek, Chester Creek, and other tributaries flowing directly into the Delaware River Estuary from Tinicum to Marcus Hook. The watershed contains a combination of point and nonpoint pollution sources including urban runoff,

streambank erosion, combined sewer outfalls, heavy industry, and commercial development. Runoff from the urban landscape carries many pollutants including bacteria, heavy metals, hydrocarbons, and nutrients. Increased water temperatures often result from the combination of urban runoff flowing into streams that have reduced shade from the sun. Many developments in this watershed are encroaching on floodplains, creating a flooding hazard during storm events. For example, severe flowing occurred in the lower portions of the watershed during record rainfall from Hurricane Floyd in 1999.

The Brandywine Creek watershed, designated as Watershed H, covers about 301 square miles and also includes White and Red Clay Creeks and the headwaters of the Christina River in Delaware. Water quality in this watershed is subject to factors similar to those of Watershed G. There is currently a "no fish consumption" advisory for parts of Brandywine Creek due to the presence of the pesticide Chlordane.

The Pennsylvania Water Resources Conservation and Protection Act has proposed legislation that will direct PADEP to complete an update of the Pennsylvania State Water Plan in 3 years and produce regular updates every 5 years thereafter. The Act will also require the water plans to identify critical water planning areas, create a water conservation program, and set water well construction standards.

4.4 PROJECTED LAND DEVELOPMENT

This section summarizes the anticipated future growth and land development in the WRTP service area, and the estimated impact of projected growth on wastewater generation. Future growth in the WRTP service area is anticipated to come from several areas, which are described in the following subsections.

4.4.1 City of Chester

DELCORA and the City of Chester anticipate the completion of numerous development projects within the City of Chester over the next several years. Two critical components of the development plan are the Keystone Opportunity Zone (KOZ) designation of areas along the river front and the recent passage of legislation that will allow for construction of a harness racing and slot machine facility in the City of Chester. Due to the size and number of development projects

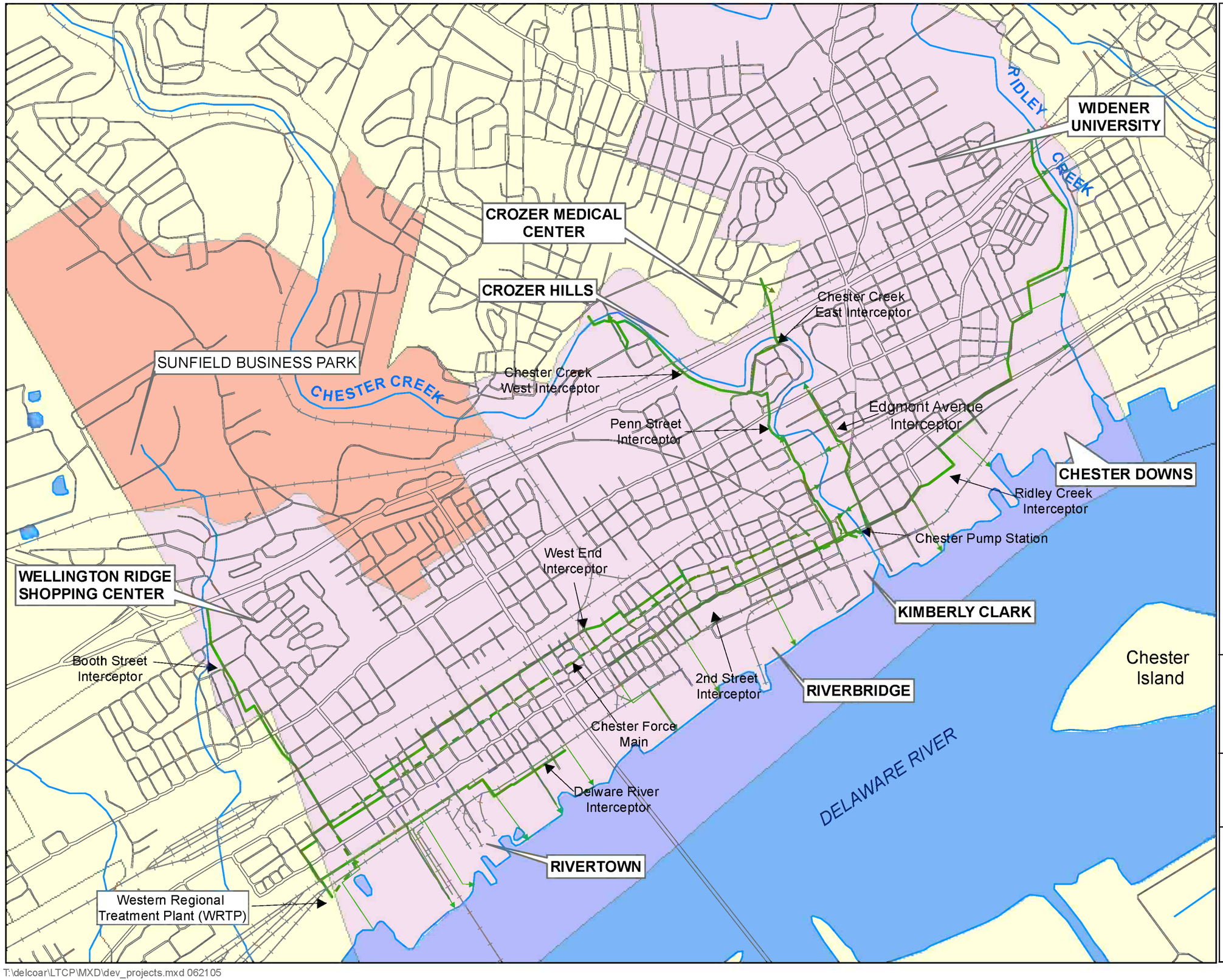
planned for the City of Chester, DELCORA completed a study in April 2005 of projected impacts of development on wastewater generation rates. Significant development projects identified in the *Riverfront Development Study* (WESTON, 2005) include the following (see Figure 4-1):

- Chester Downs Racetrack and Slot Machine Facility.
- Rivertown.
  - The Former PECO Chester Generating Station.
  - Residential.
  - Riverwalk and Mixed Use Development.
- Riverbridge Industrial Center.
- Kimberly Clark Plant Expansion.
- Wellington Ridge Shopping Center.
- Crozer Hills.
- Crozer-Chester Medical Center.
- Widener University.

4.4.1.1 Chester Downs Racetrack and Slot Machine Facility

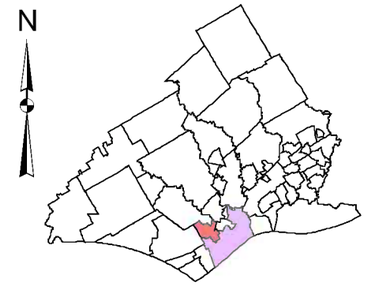
Chester Downs Racetrack and slot machine facility, which is being constructed on the site of the former Sun Shipbuilding and Dry Dock Company facility, will consist of a combination of harness racing and slot machines and will be completed in April 2006. Chester Downs will be open 18 hours per day and is expected to generate approximately 1,500 to 1,800 jobs and receive 2 million visitors per year. Additional long-term plans include considerations for a hotel, two to three restaurants, and a 1,000-seat theater. The additional long-term development is not part of the concept plan at this time.

It is conservatively estimated that Chester Downs will generate a total average wastewater flow of up to approximately 347,500 GPD. Tie-in options discussed with the developers include the Ridley Creek Interceptor, the CPS, and the Central Delaware force main. The Ridley Creek Interceptor is the nearest interceptor to the site and would be the only feasible gravity tie-in



LEGEND

- Chester Township
- City of Chester
- Interceptor
- Force Main
- Combined Sewer Outfall



Location Map

0 300 600 1,200

Feet

WESTON SOLUTIONS

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ACT 537: SEWAGE FACILITIES PLAN UPDATE

FIGURE 4-1

Locations Of Development Projects In The City Of Chester And Chester Township

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location. However, a tie-in to the Central Delaware force main was determined to be the best solution, and design of a force main tie-in was completed by the developer.

4.4.1.2 Rivertown

Along the Delaware Riverfront, a Rivertown development is planned, which will include revitalization of the former Philadelphia Electric Company (PECO) Chester Generating Station, development of residential areas and a riverwalk. Mixed use development associated with the other planned projects is also expected. The development consists of approximately 100 acres between Highland Avenue and the Barry Bridge Park, including 63 acres of the former PECO property.

The revitalization of the former PECO Chester Generating Station building into nearly 400,000 sq. ft. of Class A office space is the centerpiece of the Rivertown development. Approximately 950 people were employed at the site during the first quarter of 2005. Total wastewater discharged was estimated to be approximately 9,500 GPD, average daily flow. The building currently discharges via a gravity connection to the Delaware River Interceptor.

Residential development in the Rivertown area will include up to 1,500 condominium and town home units. The wastewater flow from these units was estimated to be up to 450,000 GPD, average daily flow.

Rehabilitation of the former PECO facility into office space and residential development is expected to draw additional mixed-use development. As an enhancement to the commercial development of the Rivertown area, construction is planned for several public facilities that would provide recreational access to the river waterfront. A 3/4-mile walkway, called the Riverwalk, will be installed along the length of the Rivertown property. Commercial development may include additional office space, restaurants, retail shopping, two marinas, other commercial services, and ultimately, a sports arena, a live-entertainment venue, a collegiate sailing center, and a hotel. The area is expected to attract significant mixed-use development in the next 5 to 10 years.

Current plans under the category of mixed-use development are for 250,000 sq. ft. of additional office space, which is expected to generate up to 1,500 additional jobs for the Rivertown area. The total average daily flows for these units were estimated to be approximately 38,200 GPD.

The nearest interceptor for wastewater flows generated from these units is the Delaware River Interceptor. A force main connection to convey flows to the WRTP is being considered for this development.

4.4.1.3 Riverbridge Industrial Center

The Riverbridge Industrial Center is a 40- to 50-acre site located at Front and Lloyd Streets. It is expected that this site will be further developed within 10 years. Currently, the most likely near-term development of the site is the conversion of existing warehouse structures into a maximum of 10,000 sq. ft. of office space, with an estimated 200 new workers. Average daily wastewater discharge associated with new development was estimated to be approximately up to 2,000 GPD. The nearest interceptor to the Riverbridge Industrial Center is the Second Street Interceptor. The Second Street Interceptor would be the only feasible option for a gravity tie-in. Long-term development possibilities include residential/commercial uses similar to the Rivertown development. Discussions with the Chester Economic Development Authority (CEDA) have emphasized the long-term potential of this property, therefore, the ultimate use estimate of 495,000 GPD average flow has been included in this planning effort.

4.4.1.4 Kimberly Clark Plant Expansion

The Kimberly Clark Corporation (formerly Scott Paper) has indicated that it may expand operations at its existing riverfront facility. It should be noted that the expansion of production capabilities is an ongoing possibility at most industrial sites, and that no definite plans have been announced by the plant.

4.4.1.5 Wellington Ridge Shopping Center

The 150,000 sq. ft. Wellington Ridge Shopping Center will be located on a 13-acre parcel on Highland Avenue at West 15th Street. The site is located in Chester's West End neighborhood between I-95 and the Wellington Ridge residential development and may include a supermarket, bank, clothing store, drug store, and restaurants. Average daily wastewater discharge associated with this development was estimated to be approximately 8,000 GPD. Wastewater generated from the shopping center would discharge to the Booth Street Interceptor.

4.4.1.6 Crozer Hills

Crozer Hills is a development planned at the intersection of Kerlin Street and West 14th Street adjoining Crozer Park, which will consist of approximately 25 new single family homes, each approximately 1,600 sq. ft. Average daily wastewater generated from this development was estimated to be approximately 10,000 GPD. The nearest interceptor sewer to this development is the Chester Creek West Interceptor.

4.4.1.7 Crozer-Chester Medical Center

The Crozer-Chester Medical Center in Upland plans to build a new 33,000-sq. ft. burn center on top of a new emergency department. Average daily wastewater discharge associated with the new center was estimated to be approximately 6,300 GPD. Additional average daily flows of 20,000 GPD have been allocated to the hospital for future expansion projects. The nearest interceptor sewer to this location is the Chester Creek East Interceptor.

4.4.1.8 Widener University

Although no definite plans are confirmed by Widener University, according to CEDA and newspaper articles, development projects being contemplated at Widener include a performing arts center, additional student housing, new commercial buildings, and a new educational building. For the purpose of estimating wastewater generation rates, it was assumed that additional student housing will have capacity to accommodate 500 students and the performing arts center was assumed to have seating capacity for 2,000. Average daily wastewater generated from student housing units and the performing arts center was estimated to be approximately 50,000 GPD. The nearest interceptor to Widener University is the Ridley Creek Interceptor.

4.4.2 Chester Township

In Chester Township, the initial stages of planning have commenced for Sunfield Business Park and Trailer Park (see Figure 4-1). The proposed development consists of a new 9-lot industrial park and 74 residential trailer homes. The feasibility of conveying wastewater to the DELCORA WRTP from this development, as well as wastewater generated from five existing single family dwellings, has been investigated. Wastewater flows were estimated by assuming 700 GPD for industrial lots, 350 GPD for single family dwellings, and 265 GPD for trailer homes. The total average daily flow was calculated to be approximately 28,000 GPD.

In addition to the current plans for the Sunfield Business Park and Trailer Park, potential future flows were considered for Chester Township and include the following:

- 22 properties at the Bridgewater Industrial Park.
- 46 properties at the I-95 Industrial Park.
- 14 additional trailer homes as approved under Eagle Management.
- A bypass of the existing Toby Farms Pump Station.

Potential future flows were estimated by assuming 700 GPD for industrial lots, 265 GPD for trailer homes, and 300,000 GPD for the Toby Farms Pump Station. The total average daily flow was calculated to be approximately 352,000 GPD. When the future flows are added to the 28,000 GPD calculated as near-term wastewater flows, the total average daily future flows are estimated to be approximately 380,000 GPD.

In order to provide connection for the immediate 112,000 GPD peak flows estimated for the Sunfield Business Park and Trailer Park, and future estimated peak flows of 950,000 GPD, two possible options exist. The first option involves the construction of a pump station and force main, which would be located either within the proposed Sunfield Business Park or within the Trailer Park. The pump station and force main would convey flows to the Chester Creek West Interceptor. The second option involves using the existing Feltonville lift station, which would receive wastewater flows generated by the development in Chester Township and convey these flows to the Booth Street Interceptor. Although an option for the built out development has not yet been decided upon, ultimately wastewater flows from Chester Township will be conveyed to the WRTP.

Future flows have been estimated for the City of Chester and Chester Township in addition to the identified projects that are currently being developed. The completion of the Chester Downs race track, Rivertown, Wellington Ridge Shopping Center, and the other revitalization projects is anticipated to spawn small service-oriented businesses such as retailing and restaurants. Residential infill for employees of the new businesses is an integral part of the revitalization concept. Improved employment and wage rate opportunities for Chester residents for whom access to employment is otherwise a problem translates into housing improvement and business investment throughout the Chester community (Clarion/Samuels, 2001). Additional flows

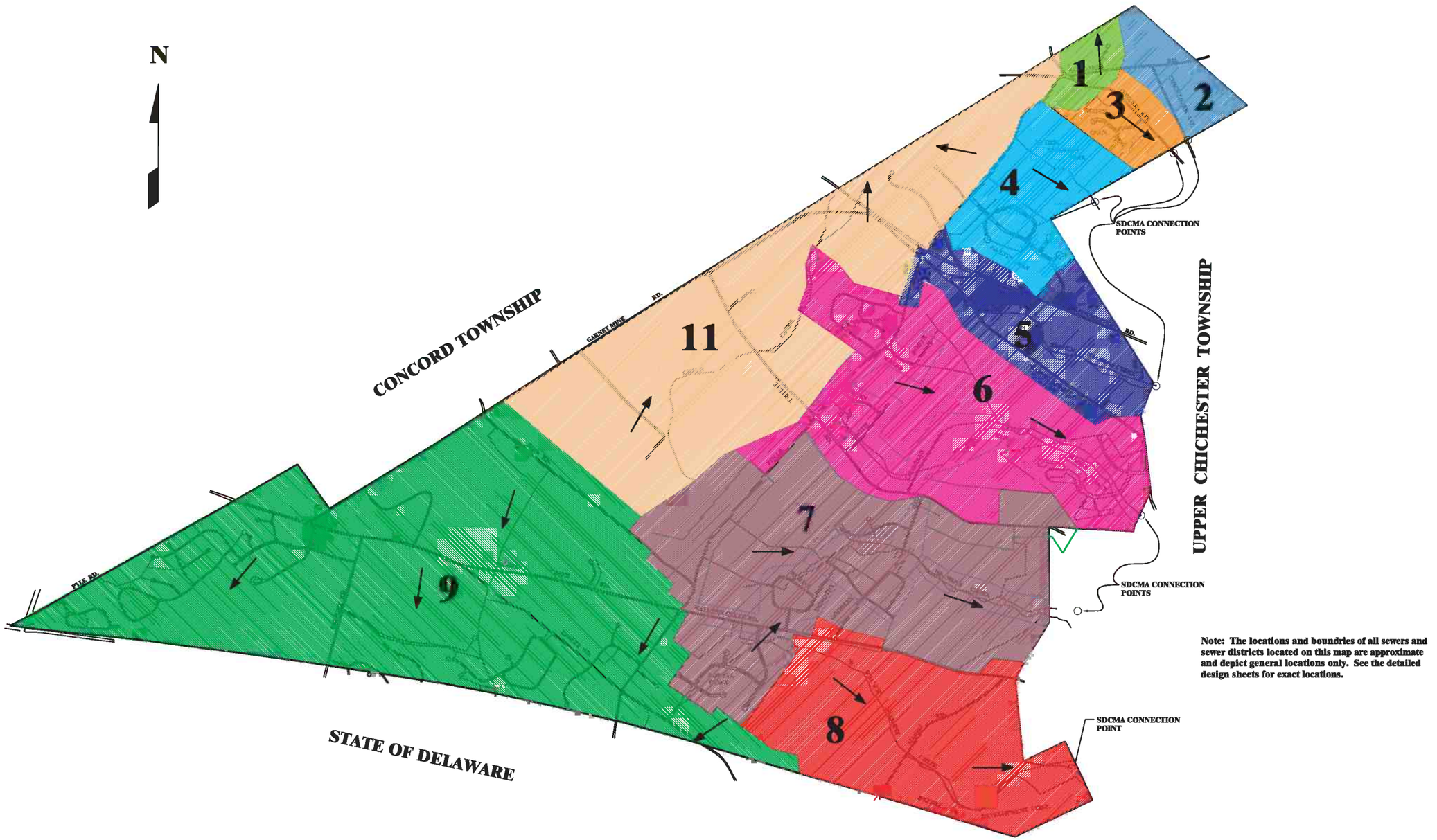
(Factor of Safety/Contingency/Future Flows) of 750,000 GPD for the City of Chester and 500,000 for Chester Township have been added to the capacity requirements for the WRTP.

4.4.3 Bethel Township

Bethel Township Sewer Authority (BTSA) is comprised of 10 districts: Districts 1-9 and 11 (District 10 was combined with District 9 and no longer exists). Figure 4-2 shows BTSA districts. Currently, flows generated in Districts 2-8 and 11 are conveyed via gravity to the SDCA. There are no public sewers in District 1. However, future flows from District 1 are scheduled to discharge to SDCA. Flows from District 9 are currently conveyed to New Castle County Department of Special Services for treatment.

Projected growth in Bethel Township motivated BTSA to evaluate the technical and economic feasibility of transmitting wastewater flows generated in Bethel Township directly to the DELCORA WRTP. A conceptual design to convey wastewater flows from all BTSA districts via a system of feeder pumps to a primary pump station, which would pump flow through a force main to DELCORA's WRTP was developed by WESTON and Bradford Engineering Associates, Inc. (Bradford Engineering) (WESTON/Bradford Engineering, 2004). The flows under consideration for the study were approximately 940,000 GPD, average daily, and approximately 2.3 MGD, peak flows. These flows included those generated in all of the sewer districts in the BTSA service area.

Several additions and modifications to the BTSA sewer system would be required to convey flows to the primary pump station, which would be located in District 5. Five new pump stations, a new force main from North Brook Pump Station, and modifications to the existing Scott's Glen Pump Station would be included in the plan. Given a maximum design flow of approximately 940,000 GPD, which was calculated based on population projections outlined in the Bethel Township 1999 Act 537 Plan Revision, a conceptual design for the primary pump station and force main was developed. The primary pump station would convey flows to the WRTP. The force main design includes the length, size, material, and proposed route from Bethel Township to DELCORA's WRTP. The primary pump station design includes the number of pumps required and a possible pump choice. Refer to the Bethel Township Service Study: Summary Report for a detailed discussion (WESTON/Bradford Engineering, 2004).



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Legend

- TOWNSHIP BOUNDARY
- DISTRICT 1
- DISTRICT 2
- DISTRICT 3
- DISTRICT 4
- DISTRICT 5
- DISTRICT 6
- DISTRICT 7
- DISTRICT 8
- DISTRICT 9
- DISTRICT 11

N
W E
S

BTSA
Sanitary Sewer System
District Plan

Figure 4-2

Bethel Township
Service Study

DELCORA\BTSA SERVICE STUDY\REPORT\DISTRICT MAP\FIGURE A-1.DWG

4.4.4 Crum Creek Watershed

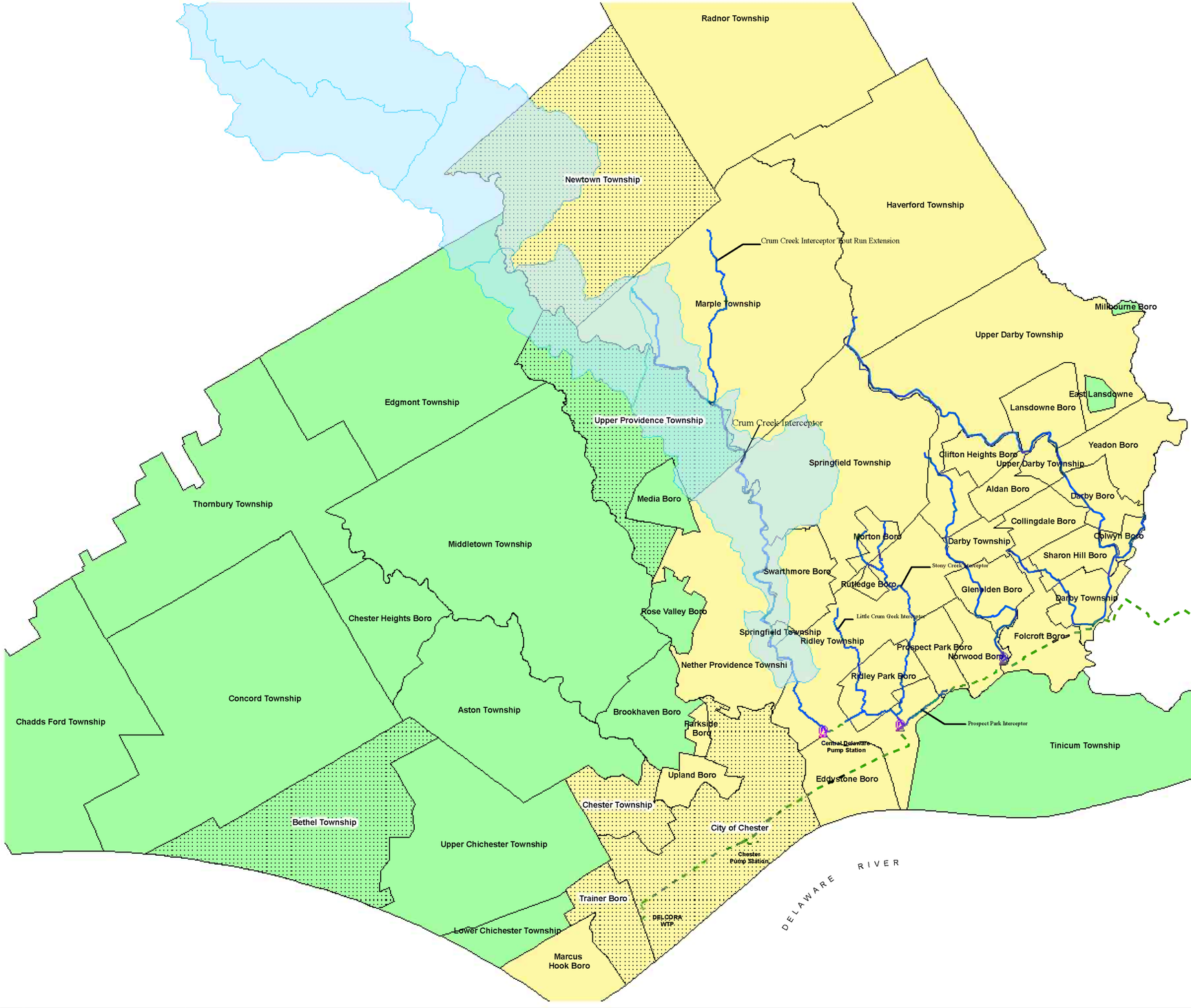
In 1999, DELCORA commissioned Kelly Engineers to conduct a flow study for those portions of Newtown, Edgmont, and Upper Providence Townships within the Crum Creek watershed. The intent of the study was to compile existing and future sewage flow data to determine the feasibility of providing new facilities or enhancing existing facilities needed to accommodate existing and future wastewater flows.

The majority of the study area is serviced by individual on-lot sewage systems. A few sewered portions are tributary to municipal sewage systems. Due to development over the past 40 years as well as the pressure of future development, the need to provide adequate sewage facilities to the region has heightened. One option for satisfying this need is to extend the Crum Creek Interceptor along the western side of the Geist Reservoir, following the creek through Upper Providence into Edgmont and Newtown Townships (see Figure 4-3).

Presently, the CDCA owns and operates an interceptor along Crum Creek that extends from the Crum Creek Pump Station in Ridley Township to the Delaware County Community College in Marple Township. The interceptor follows Crum Creek and passes through the southeastern portion of Upper Providence Township and then in a northeasterly direction to its terminus at Delaware County Community College. Extending the interceptor along the western side of the reservoir would allow the study area to be serviced.

Catania Engineering Associates, Inc. completed a Capacity Analysis and Future Flow Study for the Crum Creek Interceptor in August, 2005. Projected flows from this study are included in this Act 537 Update.

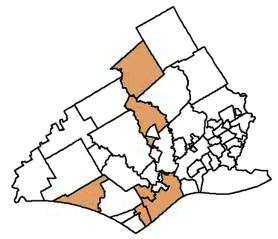
Flow through the Crum Creek Interceptor is conveyed to the Crum Creek Pump Station and then to the CDPS. As described in Section 3.1.2, flow pumped by CDPS is split. Flow goes east to the PSWPCP and west, via the Central Delaware force main and Chester force main, to the WRTP. Additional growth in Newtown and Upper Providence Townships and the extension of the Crum Creek Interceptor to accommodate this growth, may dictate the need to increase the amount of flow conveyed to the WRTP from the CDPS.



LEGEND

- Interceptor
- Forcemain
- A Pump Station
- DELCORA Served Community
- Other
- Potential WRTP Service Areas
- Crum Creek Watershed

N



Location Map

0 0.5 1 2 Miles

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FIGURE 4-3

Potential WRTP Service Areas: Chester, Newtown, Upper Providence, and Bethel Township

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4.4.4.1 Newtown Township

Newtown Township has a total area of 6,470 acres with approximately 3,650 acres of the township included in the Crum Creek watershed (approximately 56% of the Township's total area). Newtown Township is currently generating an average daily wastewater flow of approximately 438,200 GPD. No future growth or documented future wastewater flows within the source area for the Crum Creek Interceptor were estimated for Newtown Township by Catania in the Crum Creek Interceptor Capacity Analysis and Future Flow Study (2005). A previous Sanitary Sewage Flow Study (Kelly Engineers, 14 December 1999) included future additional wastewater flow estimated at 457,400 GPD for Newtown Township. The Newtown Township Act 537 Plan (Peter Krasas Jr. & Associates, May 23, 2002) contains population forecasts based on proposed development that exceed the DVRPC estimates. However, flows from a newly created sewer district are planned to discharge to the CDCA Interceptor. The Act 537 Study states that utilization of CDCA sewage facilities will eliminate the need for the existing 85,000-GPD stream discharge sewage treatment plant along with the future need to expand this plant to 150,000 GPD. Connecting to the CDCA Interceptor will also make it possible to eliminate the existing Springton Pointe Estates STP that serves 118 existing homes. For the purposes of this study, future flows from Newtown Township have been estimated to include the 150,000 GPD sewage treatment plant plus the 118 dwellings at Springton Pointe Estates at 2.80 GPD per home.

4.4.4.2 Upper Providence Township

Upper Providence Township has a total area of 3,795 acres with approximately 2,100 acres of the township included in the Crum Creek watershed (approximately 55% of the Township's total area). The Crum Creek Interceptor Capacity Analysis and Future Flow Study (Catania, 2005) includes an estimate that the average daily flow currently generated by Upper Providence Township is 540,120 GPD. Estimated future wastewater flows generated within Upper Providence Township total approximately 35,840 GPD. The Upper Providence Township Act 537 Plan (Kelly Engineers) recommends that Upper Providence Township pursue membership in the CDCA.

4.4.5 Projected Impact to DELCORA's System

Anticipated growth will generate significant increases in wastewater flows conveyed to the WRTP. Table 4-3 summarizes estimated potential and future flows. Potential flows are those flows that are currently generated, but are not being discharged to DELCORA's WRTP. Such flows are generated in Bethel, Newtown, and Upper Providence Townships. If growth continues in these areas, flows may be conveyed to the WRTP. Potential flows include areas that are currently serviced by on-lot disposal systems that may connect to the public system if the interceptor is extended and public sewers become available. Future flows are additional flows that are anticipated to be generated due to new development and are estimated based on planning projections. Development within the City of Chester is expected to generate the most wastewater, primarily because of the development and revitalization planned for the Delaware Riverfront. Also, depending on the future plans at Sunfield Business Park and Trailer Park, development at this site may significantly increase wastewater flows conveyed to the WRTP. The following subsections discuss how DELCORA's infrastructure, including the interceptor system, CSOs, pump stations, force mains, and the WRTP will be affected by continuing growth.

Table 4-3
Summary of Potential/Future Wastewater Flows to DELCORA's WRTP

Sources of Potential/ Future Flow to the WRTP		Average Flow (GPD)
City of Chester[1]		
Chester Downs		347,500
Widener University		50,000
Rivertown		497,700
Riverbridge Industrial Park		495,000
Shopping Center		8,000
Crozer Hills		10,000
Crozer-Chester Medical Center		26,300
	Subtotal	1,434,500
Chester Township[2]		
Sunfield Business Park- short term projected flow		28,000
Sunfield Business Park- potential future flow		352,000
	Subtotal	380,000
Bethel Township[3]		
Existing flows		266,000
Additional future flows		673,650
	Subtotal	939,650
Newtown Township[4]		
Existing flows		438,200
Additional future flows		183,040
	Subtotal	621,240
Upper Providence Township[4]		
Existing flows		540,120
Additional future flows		35,840
	Subtotal	575,960
Other Flow Inputs		
Planning Module Exemptions from Chapter 94 Report[5]		333,844
Factor of Safety/Contingency/Future Flows		1,800,000
	Subtotal	2,133,844
	TOTAL FLOW	6,085,194

References:
[1]Table 3-1 Riverfront Development Study, WESTON, 2005
[2]*Preliminary Sanitary Sewer Feasibility Study: Chester Township, Sunfield Business Park and Trailer Park*
[3]Table 1 Bethel Township Service Study, WESTON, 2004
[4]Catania, 2005, p. D-2 and Newtown Twp. Act 537 Plan, 5/23/2002.
[5]Appendix 3 of the Chapter 94 Report - West, DELCORA, 2004.

4.4.5.1 Interceptors

Generation of additional wastewater due to development within the WRTP service area affects several of the interceptors that comprise DELCORA's interceptor system. The interceptors most likely to be significantly affected by growth along the Delaware Riverfront include the Ridley Creek, Second Street, and Delaware River Interceptors. In addition, the Chester Creek East, Chester Creek West, and Booth Street Interceptors may be affected by development to the north and northwest of the City of Chester. The hydraulic evaluation of the interceptor system, as described in Section 3.2.2, showed that the affected interceptors have limited capacity to receive additional flows from development areas. Alternatives to ensure sufficient interceptor capacity are discussed in Section 5.

As part of the collection system hydraulic evaluation described in Section 3.2.2, two additional scenarios were modeled for future conditions: the future average daily flow and the future maximum daily flow. The model results indicate which areas of the interceptor system are projected to have limited capacity to convey average and peak dry weather flows under future conditions. These results are summarized in Table 4-4 and in Figure 4-4.

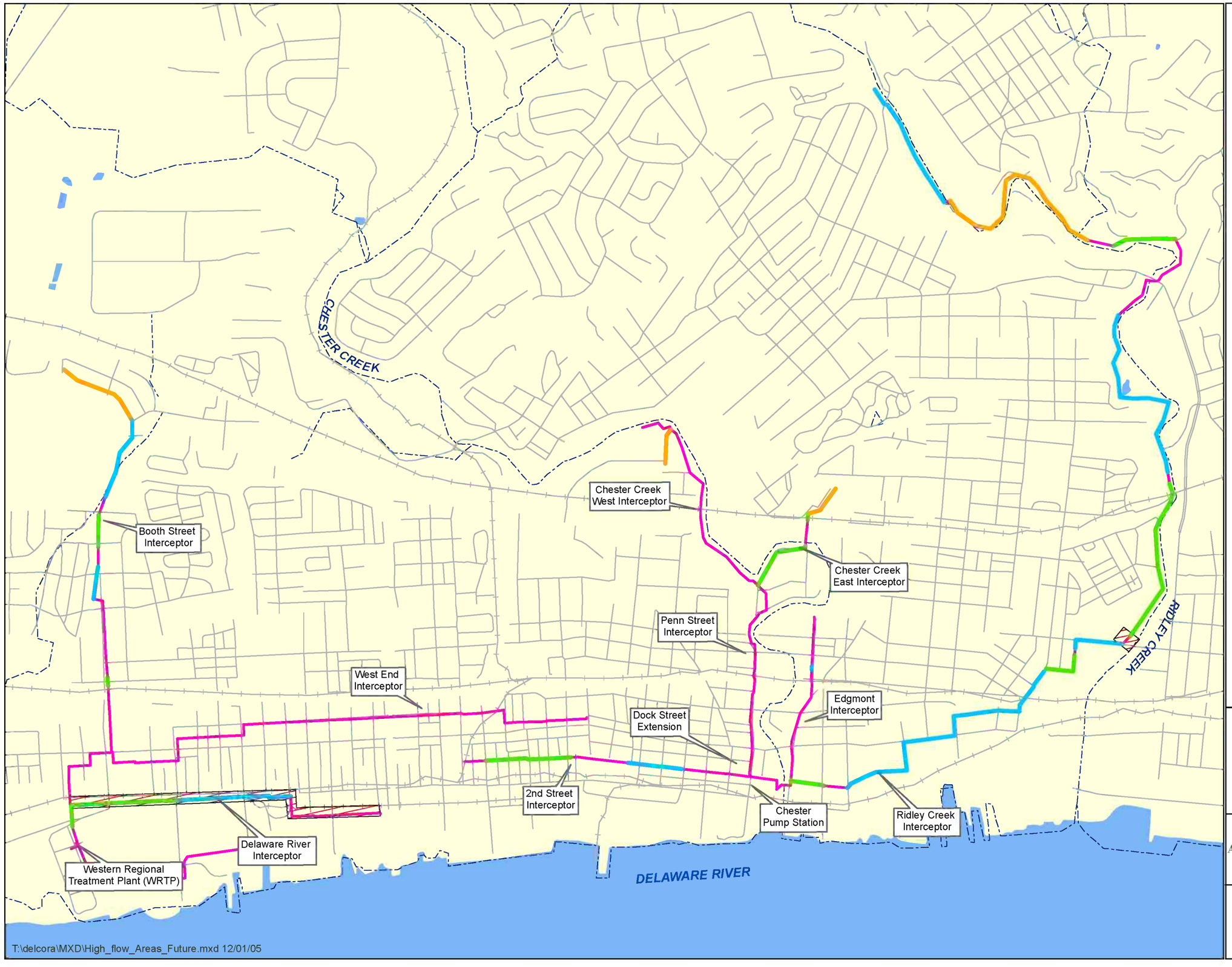
The following results summarize the areas where the increased future flows affect the interceptor system:

- The model indicates that the gravity interceptor system is not surcharged under average daily future flow conditions. The following is a list of additional locations in the gravity interceptor system where the pipe is flowing 50% full or greater:
  - Booth Street Interceptor between MH 02-007-028 and MH 02-007-027-006, most likely due small diameter pipe (8- and 10-inch); between MH 02-007-017 and MH 02-007-019, most likely due to adverse slope conditions; and between MH 02-007-004 and MH 02-007-005, most likely due to adverse slope conditions.
- The model indicates that the gravity interceptor system does surcharge under future maximum flow conditions. The following is a list of additional locations in the gravity interceptor system where the pipe is flowing 75% full or greater:
  - Ridley Creek Interceptor between MH 07-066 and MH 07-070 is flowing under pressure, most likely due to a flat slope and small-diameter pipe(less than 30-inch); and between MH 07-031 and MH 04-042 is flowing greater than 75% full, most likely due to adverse slope conditions.

Table 4-4
Summary of Model Results for Future Conditions

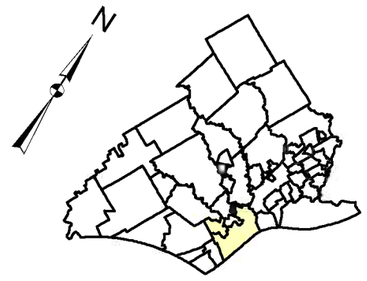
Interceptor Name	From Manhole	To Manhole	Scenario		Manholes Surcharging at Future Maximum Conditions
			Future Average Flow	Future Maximum Flow	
Delaware River	01-010	01-016	-	≥ 50% ≤ 75%%	none
	01-006	01-010	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
	01-003	01-006	-	≥ 75% ≤ 100%	
Booth Street	02-007-028	02-007-027-006	≥ 50% ≤ 75%	Pressure Flow	02-007-027-002 through 006 and 02-007-019
	02-007-021	02-007-028	-	≥ 50% ≤ 75%	
	02-007-017	02-007-019	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
	02-007-014	02-007-016	-	≥ 50% ≤ 75%	
	02-007-004	02-007-005	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
Second Street	04-014	04-020	≥ 50% ≤ 75%	≥ 75% ≤ 100%	none
	04-006	04-010	-	G.T. 50%	
Chester Creek West	05-034	05-034-002	≥ 50% ≤ 75%	100%	05-034-001
Chester Creek East	05-020-007	05-020-010	≥ 75% ≤ 100%	Pressure Flow	05-020-007 through 010
	05-020-006	05-020-007	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
	05-020A	05-020-003	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
Edgmont Avenue	at 06-010		≥ 50% ≤ 75%	≥ 50% ≤ 75%	none
Ridley Creek	07-084	07-092	-	≥ 50% ≤ 75%	07-072 through 083
	07-071	07-083	≥ 75% ≤ 100%	Pressure Flow	
	07-066	07-070	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
	07-043	07-059	-	≥ 50% ≤ 75%	
	07-031	07-042	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
	07-026	07-030	-	≥ 50% ≤ 75%	
	07-022	07-025	≥ 50% ≤ 75%	≥ 75% ≤ 100%	
	07-006	07-021	-	≥ 50% ≤ 75%	
	07-002	07-005	≥ 50% ≤ 75%	≥ 75% ≤ 100%	

≥ = pipe is flowing greater than or equal to.
≤ = pipe is flowing less than or equal to.
- = pipe is flowing less than 50 % full.



LEGEND

- Pipe Flowing 100% Full
- Pipe Flowing Greater than 75% Full
- Pipe Flowing Greater than 50% Full
- Interceptors
- Observed Flowing Full



Location Map

0 750 1,500 3,000

Feet

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Figure 4-4
Areas of High Flow During Future Maximum Flow Conditions

- Booth Street Interceptor between MH 02-007-028 and MH 02-008-027-006 is flowing under pressure, most likely due small diameter pipe (8- and 10-inch); between MH 02-007-017 and MH 02-007-019 is flowing greater than 75% full, most likely due to adverse slope conditions; and between MH 02-007-004 and MH 02-007-005 is flowing greater than 75% full, most likely due to adverse slope conditions.

4.4.5.2 Pump Stations and Force Mains

The CPS receives flow from Ridley Creek, Second Street, Penn Street, Chester Creek West, Chester Creek East, and Edgmont Avenue Interceptors and discharges to the Chester force main. Although any additional flow to these interceptors would increase the flow to the CPS and the Chester force main, both have adequate capacity to accommodate additional flows from planned projects.

Flows pumped through the CDPS can be split; some or all flows can be conveyed east to the PSWPCP and some are conveyed west via the Chester force main to the WRTP. The total capacity of the CDPS is 40 MGD. The flow split from CDPS to the WRTP is currently limited to 13.3 MGD, based on available capacity at the WRTP, and maintained by a motorized control valve.

Wastewater flows generated within the Crum Creek watershed are ultimately conveyed to the CDPS, where flow is split between the WRTP and the PSWPCP. Growth within the Crum Creek watershed will generate additional wastewater flows that may dictate the need to increase the flow split to the WRTP. An engineering study was completed in August, 2005, by Catania Engineering Associates that investigated the feasibility of increasing the amount of flow conveyed from the CDPS.

4.4.5.3 WRTP

The flow generated from areas of growth within the WRTP service area and potential service areas will be conveyed to the WRTP. The average daily flow total for all projects documented in Table 4-3 is estimated to be approximately 4.1 MGD. As noted in Section 3.1, average flow through the WRTP in 2005 was 38.99 MGD. The addition of 4.1 MGD to the existing average flow would increase the average daily flow to the WRTP to 43.09 MGD, or 97.9% of the existing permitted capacity. A further increase of 10% in wastewater generation due to currently

unforeseen development projects over the next 5 to 10 years would raise the average flow to the WRTP to 47.4 MGD, exceeding the current permitted capacity.

4.5 WASTEWATER PLANNING NEEDS FOR THE STUDY AREA

4.5.1 General Sewage Facilities Needs

The sewage facilities needs of Delaware County are widely varied and are addressed specifically in the individual municipal Act 537 plans. However, using the methods developed in previous Act 537 plan updates, the needs generally can be categorized into four groups (Categories A through D) based on two criteria: the availability of existing public sewage facilities (both conveyance and treatment) covering the majority of the municipality and projected growth through the planning horizon to 2025.

Category A municipalities currently have a well-developed sanitary sewer collection system covering most of the municipality (thus few OLDS) and are projected to have significant growth by 2025. In general, the sewage needs of this area would be sufficient capacity for existing and future flows and sufficient collection capacity to transport the existing and future flows to treatment facilities.

Category B municipalities also currently have a well-developed sanitary sewer collection system covering most of the municipality (thus few OLDS) and are not projected to have significant growth by 2025. In general, the sewage needs of this area would be sufficient treatment capacity to meet existing demand and maintaining sufficient collection capacity to convey these flows to treatment facilities.

Category C municipalities currently do not have a widely developed public sanitary sewer collection system, and the residential population is expected to grow significantly by 2025. In this category, the sewage needs of this area are widely varied. Some municipalities in this category have community treatment systems (package treatment plants), some have public sanitary sewer and treatment systems, and others have a high percentage of OLDS. The sewage needs for this category include sufficient public treatment and collection capacity for existing and future flows, sufficient treatment capacity for community systems, and sufficient treatment

capacity for both existing and proposed areas served by OLDS, including failing OLDS, either individually or on a community-wide (single development) basis.

Category D municipalities currently do not have a widely developed public sanitary sewer collection system serving the municipality, and the residential population is not expected to grow significantly by 2025. These municipalities typically have developed residential communities served by OLDS, and remaining lands available for development are limited. The sewage needs for this category would include sufficient public treatment and collection capacity for existing flows, sufficient treatment capacity for community systems, and sufficient treatment capacity for existing areas served by OLDS, including failing OLDS, either individually or on a community-wide (single development) basis. Table 4-5 depicts the four categories and the disposition of each municipality in the Study Area.

4.5.2 Area-Specific Sewage Facilities Needs

DELCORA continually reevaluates its sewage collection, conveyance, and treatment facilities needs by a variety of means, including the regular system modeling updates discussed in Chapter 3, annual Chapter 94 capacity reporting, and Act 537 plan updates such as this one. DELCORA's Long-Term CSO Management Plan also documents measures by which DELCORA evaluates system needs and prioritizes improvements.

It is DELCORA's mission to provide environmentally responsible and cost-effective wastewater management services to the citizens, businesses, and industries of Delaware County.

Table 4-5

Sewage Facilities Needs Categorization Matrix

Criteria	Category A	Category B	Category C	Category D
Availability of Existing Public Sewage Facilities	Yes	Yes	No	No
Projected Population Growth Greater than 25%	Yes	No	Yes	No
Municipalities	City of Chester, Bethel Twp. Chester Twp.	Trainer Borough,	Newtown Twp.	Upper Providence Twp.
Needs	Treatment capacity Collection system capacity	Treatment capacity Collection system capacity	Treatment capacity Collection system capacity Maintain OLDS treatment capacity	Treatment capacity Collection system capacity Maintain OLDS treatment capacity

5. PLANNING AND FACILITIES ALTERNATIVES AND EVALUATIONS

5.1 INTRODUCTION

Information concerning existing public and private sewage facilities, sewage infrastructure needs, and planning efforts to date has been provided throughout Sections 1 through 4 of this document. The purpose of this section is to use the information that has been summarized to develop alternatives to assure adequate capacity to convey flows from areas served or potentially served by the WRTP to the plant.

The alternatives considered in this document are limited to those that would support a re-rate of the WRTP from 44 MGD to 50 MGD. Because the capacity of the WRTP to receive and effectively treat 50 MGD has already been demonstrated, the scope of this chapter will be further narrowed to include only alternatives that would affect the collection system and would be necessary to ensure that an average daily flow of 50 MGD can be reliably conveyed to the WRTP.

5.1.1 Potential for Regional Wastewater Treatment

DELCORA is a regional wastewater treatment authority with a charter to serve Delaware County. DELCORA is working to address the wastewater treatment needs of every municipality within Delaware County that wishes to take advantage of regional wastewater collection and treatment. Population growth and the potential for future economic growth within Delaware County combined with the objective of providing regional wastewater treatment have produced a need to re-rate the WRTP to treat average flows of up to 50 MGD, as well as to evaluate the collection system to assure adequate conveyance to increased flows to the treatment plant.

Some of the older sections of the WRTP service area have maintenance challenges including aging of the systems and I&I. Act 537 updates for municipalities such as Aston, Bethel, Brookhaven, Middletown, Upper Chichester, and Upper Providence identified I&I as a problem at least for portions of their systems.

5.1.2 Private Facilities

It is felt that discussions of private facilities are not relevant to the WRTP re-rate because wastewater generated in the areas served or potentially served by the WRTP is conveyed exclusively by public facilities.

5.2 POTENTIAL FOR EXTENSION OF EXISTING FACILITIES TO AREAS IN NEED OF NEW OR IMPROVED FACILITIES

Construction of a new lift station in the Rivertown area or new force main connections to support new development such as the race track in the City of Chester are feasible alternatives to service these areas of potential growth. Although projected flows from these developments have been included in the future conditions analysis of the collection system, the pump station and connections will be the responsibility of the developer and will not be implemented by DELCORA.

5.3 ALTERNATIVES TO ADDRESS THE CONDITION OF EXISTING PUBLIC INFRASTRUCTURE

WRTP service areas and potential service areas include the dense urban areas of eastern Delaware County and parts of the more rural areas of western Delaware County. These areas face the dual challenge of upgrading older systems and at the same time adding capacity to service an increasing population in western Delaware County municipalities and selected areas of development in eastern Delaware County.

A capacity analysis of the existing conveyance facilities is presented in Section 3.2 of this document. Table 3-2 identifies those segments of the interceptor and force main systems that have limited capacity. Projected flows from potential WRTP service areas were evaluated and added to the capacity analysis in Section 4. Sections of the interceptors within the existing area served by the WRTP are somewhat limited in terms of capacity to accept additional flows. The force mains, on the other hand, have sufficient capacity to accept additional flows. This suggests that with respect to large new developments, tie-ins to the existing force mains are preferred over tie-ins to the existing interceptors, where feasible, unless the interceptors are expanded. Table 5-1 lists the segments of the gravity interceptors that were simulated to flow at 100% full or under pressure in the future conditions simulation.

Table 4-4 shows simulated maximums for the existing flow scenario in the Delaware River Interceptor to be greater than 50, but less than 75%. In contrast to the model results, DELCORA personnel reported that this interceptor flows full during storm events. The SewerCAD model simulated dry-weather flow conditions in the interceptors. The Delaware River Interceptor is a combined sewer and observations of high flow have been made during wet weather. DELCORA is planning to visually inspect the Delaware River Interceptor and continue an investigation to identify blockages or undocumented sources of inflow.

Table 5-1
Interceptors with Limited Capacity for Planned Conditions

Interceptor Name	Upstream Manhole	Downstream Manhole	Scenario		Manholes Surcharging at Maximum Conditions
			Average Flow	Maximum Flow	
Booth Street	02-007-027-006	02-007-028	≥ 50% ≤ 75%	Pressure Flow	02-007-027-002 through 006 and 02-007-019
Chester Creek West	05-034-002	05-034	≥ 50% ≤ 75%	100%	05-034-001
Chester Creek East	05-020-010	05-020-007	≥ 75% ≤ 100%	Pressure Flow	05-020-007 through 010
Ridley Creek	07-083	07-071	≥ 75% ≤ 100%	Pressure Flow	07-072 through 083

≥ = pipe is flowing greater than or equal to.
≤ = pipe is flowing less than or equal to.

The interceptor segments listed in Table 5-1 are shown in Figure 4-4. Alternative measures to address the condition of the existing public infrastructure within areas served or potentially served by the WRTP are discussed in the following subsections. The alternative measures can be implemented alone or in combination to maximize the capacity and operating efficiency of the existing conveyance system.

5.3.1 Interceptor Capacity Upgrade Alternatives

Reducing I&I and/or structural interceptor capacity upgrades can maximize the overall capacity of the existing system. Based on the results of the capacity analysis, the locations listed in Table 5-1 have limited capacity to convey existing peak flows and/or support new development.

5.3.1.1 Booth Street Interceptor

The Feltonville Pump Station collects wastewater from the gravity system in Chester Township and discharges it to the upper end of the Booth Street Interceptor. A 1,320-foot section of 8-inch and 10-inch pipe at the upstream end of the Booth Street Interceptor is simulated in the model to flow under pressure under future maximum flow conditions because the small-diameter pipe will not accommodate the additional flows when the Sunfield Development is built out.

The proposed Sunfield Business Park and Trailer Park includes a new 9-lot industrial park development, 5 existing single-family homes, and 74 residential trailer homes. A feasibility study was prepared by Catania Engineering Associates, Inc. in May 2004 and estimated that average daily flow from the proposed Sunfield Development will be approximately 27,660 GPD and the estimated maximum flow will be 112,000 GPD. The capacity of the Feltonville Pump Station is 290,000 GPD. The current maximum flow into the Booth Street Interceptor is 179,000 GPD. Table 5-2 presents the estimated flows for the Sunfield Business Park and Trailer Park.

Table 5-2 Estimated Flows from Sunfield Business Park

Development Component	Estimated Average GPD	Estimated Maximum GPD
9 Industrial Lots	6,300	53,400
5 Single Family Homes	1,750	4,375
74 Trailer Homes	19,610	49,025
Totals	27,660	112,000

Additional connections to the collection system that are prompted by construction of the Sunfield Development include 22 properties from the Bridgewater Industrial Park, 46 properties from the I-95 Industrial Park, 14 additional trailer homes as approved under Eagle Management, and a bypass of the existing Toby Farms Pump Station. Average flows from these connections are estimated to be 352,000 GPD. When average flows from the additional tie-ins are added to the projected averages from the Sunfield Development, the total future flows are estimated to be 380,000 GPD average and 1.3 MGD peak.

The Sewer CAD model estimates that the Booth Street Interceptor begins to flow under pressure at 609,000 GPD. Subtracting the existing peak flow of 179,000 GPD from a capacity of 609,000 GPD calculates the remaining capacity in the Booth Street Interceptor to be 430,000GPD. Build-

out of the proposed Sunfield Business Park and Trailer Park along with the other proposed connections will require upgrading the capacity in the Booth Street Interceptor and the Feltonville Pump Station.

The following alternatives are proposed to increase capacity in the affected section of the Booth Street Interceptor prior to build-out of the Sunfield Business Park and Sunfield Trailer Park:

1. Upgrade of Feltonville Pump Station and increase diameter of pipe (would need a minimum of 15-inch diameter pipe to replace the current 8- and 10-inch pipe). The model results indicate that the rest of the Booth Street Interceptor has adequate capacity.

2. No Action

5.3.1.2 Chester Creek West Interceptor

A 444-foot section of 12-inch pipe at the upstream end of the Chester Creek West Interceptor is simulated to flow at 100% of capacity during current as well as future maximum flow conditions due to the diameter of the pipe and the flat nature of the system at that location. This section of pipe carries the flow from Upland Borough and there are no predicted increases to be added. The following alternatives are proposed to increase capacity in the affected section:

1. Install parallel interceptor following additional metering and studies to identify and eliminate I&I. I&I in existing infrastructure must be minimized prior to capital expenditure on new interceptor;
2. Replace existing interceptor with larger pipe (would need a minimum of 15-inch diameter pipe to replace the current 12-inch pipe, but the flow would still be greater than 75% full during maximum flow conditions; an 18-inch diameter pipe would bring the flow down to less than 75% full).
3. Perform additional metering and study to reduce I&I in this interceptor to determine whether more economical I&I mitigation can restore capacity to the existing interceptor. The study and mitigation should precede design and implementation of structural capacity upgrades.
4. No Action.

5.3.1.3 Chester Creek East Interceptor

A 540-foot section of 12-inch pipe at the upstream end of the Chester Creek East Interceptor is simulated to flow under pressure during existing and future maximum flow conditions because the 12-inch diameter pipe is not able to accommodate peak flows or additional flows from Crozer Hospital. Manholes in the identified section are surcharging under maximum flow conditions but not to the top of the manholes, meaning that the pressure flow is not creating

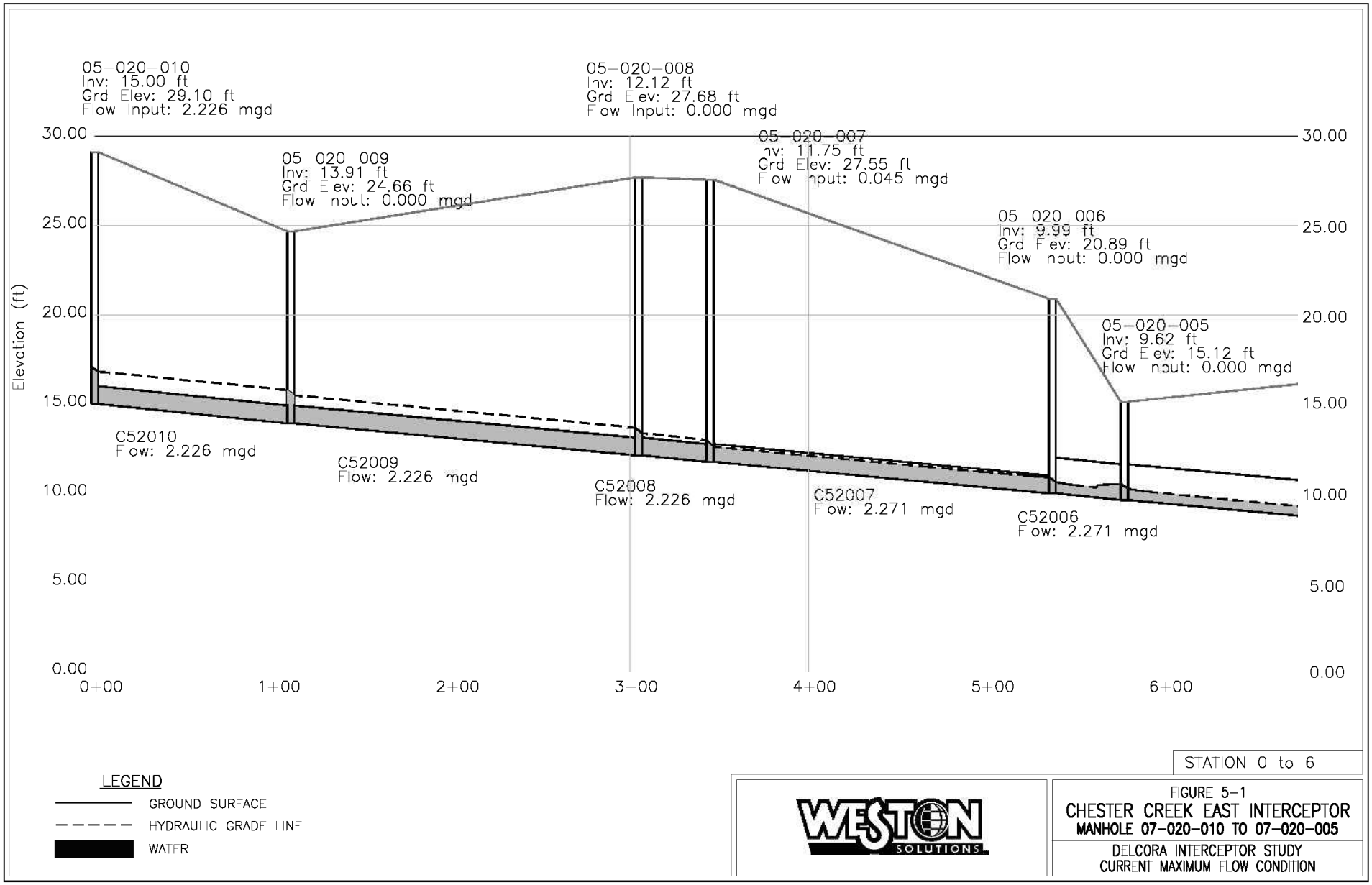
sewer system overflows through the manholes. However, the potential for flows to back up into basements is recognized, but has not been reported. Figure 5-1 is a profile view of the upstream portion of the interceptor where pressure flow occurs. The pipe begins to flow under pressure when the slope decreases. The flow in the manholes shown in Figure 5-1 is the worst case of surcharge in the section of pressure flow. The following alternatives were evaluated to increase capacity in the affected section:

1. Install parallel interceptor.
2. Replace existing interceptor with larger pipe to achieve adequate capacity (would need a minimum of 15-inch diameter pipe to replace the current 12-inch pipe).
3. Perform I&I Study to reduce peak flows in the interceptor.
4. No Action.

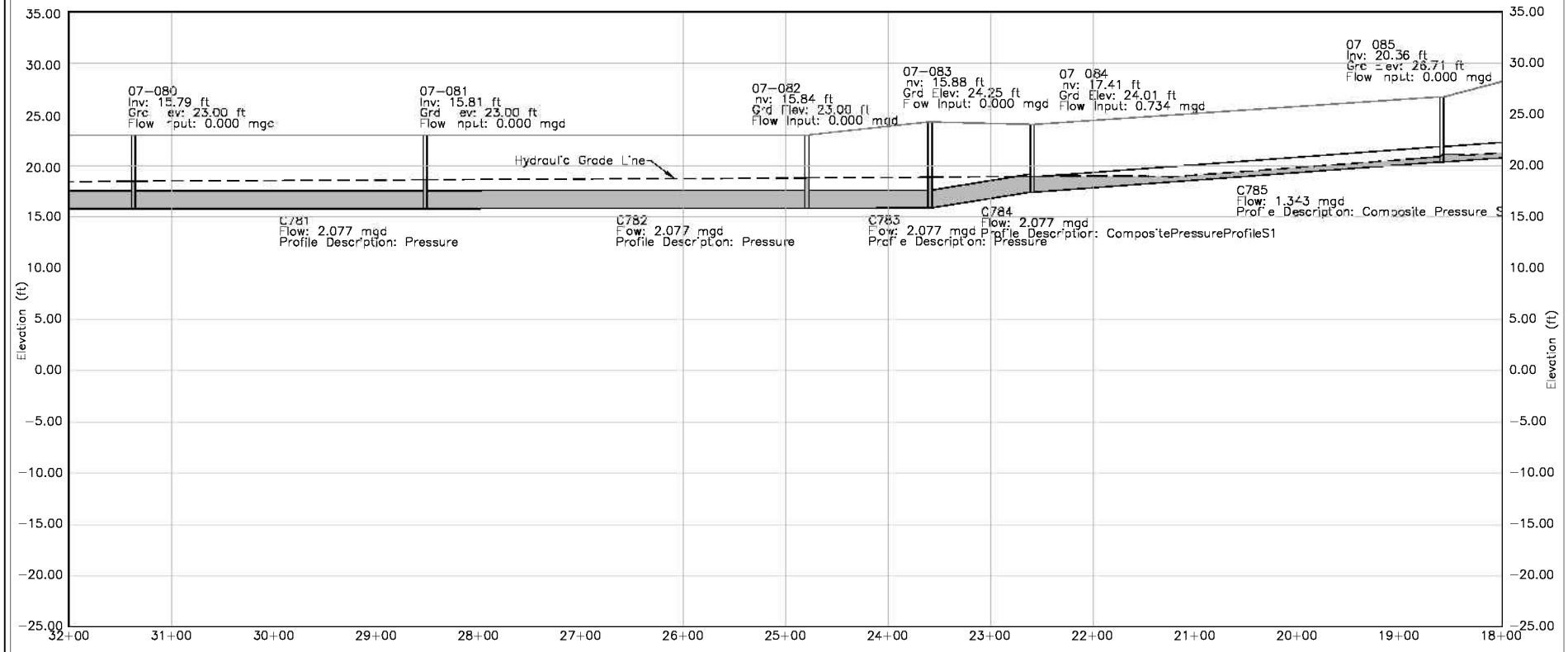
The no action alternative is acceptable for this interceptor; however, I&I abatement in non-combined areas will maximize the efficiency of the system. An I&I study is recommended to identify specific actions to reduce I&I in the Chester Creek East Interceptor.

5.3.1.4 Ridley Creek Interceptor

A 3,640-foot section of 21-inch pipe near the upstream end of the Ridley Creek Interceptor is simulated to flow under pressure during current and future maximum flow conditions. The segment flowing under pressure is on a flat slope. There are no significant additional loadings from potential service areas upstream of the deficient section of the Ridley Creek Interceptor because this area is essentially built-out. Flows downgrade of Manhole 07-071 are acceptable and adequate capacity for conveyance remains in those segments. Manholes in the identified section are surcharging under maximum flow conditions but not to the top of the manholes, meaning that the pressure flow is not creating sewer system overflows through the manholes. However, the potential for flows to back up into basements is recognized, but has not been reported. Figure 5-2 is a profile view of the upstream portion of the interceptor where pressure flow occurs. The pipe begins to flow under pressure when the slope decreases. The flow in the manholes shown in Figure 5-2 is the worst case of surcharge in the section of pressure flow. The no action alternative is acceptable for this interceptor; however, I&I abatement in non-combined



FILE NO. G:\ACADPROJ\05623019012 DELCORA Interceptor\Figure 5-1.dwg



LEGEND

GROUND SURFACE

HYDRAULIC GRADE LINE

WATER

STATION 32 to 18

FIGURE 5–2

RIDLEY CREEK INTERCEPTOR

MANHOLE 07–085 TO MANHOLE 07–080

DELCORA INTERCEPTOR STUDY

CURRENT MAXIMUM FLOW CONDITION

FILE NO. G:\ACADPROJ\05623019012 DELCORA Interceptor\Figure 5-2.dwg

areas will maximize the efficiency of the system. An I&I study is recommended to identify specific actions to reduce I&I in the Ridley Creek Interceptor.

5.3.1.5 Delaware River Interceptor

The Sewer CAD model simulation of the Delaware River Interceptor indicates that it has adequate capacity to convey existing and planned peak flows to the WRTP. However, flow restrictions have been observed in the field. To determine the cause, DELCORA initiated a program of pipe cleaning and televising. This effort is expected to be completed by 4th quarter 2005. For future flows in this area, such as those from the planned Rivertown development, it is recommended that conveyance other than the Delaware Interceptor be used. The planning effort for treating wastewater from the proposed Rivertown development includes construction of a separate force main to convey flow directly to the WRTP. Figure 5-2 shows the recommended alignment of the new force main. The following are possible alternatives for treating flows from the planned Rivertown Development:

1. Construct a new force main connection to the WRTP.
2. Convey flows through the existing Delaware River Interceptor.

5.3.2 Upgrades to Trainer Borough Collection System

DELCORA assumed ownership of the Trainer Borough wastewater collection system on 15 August 2005. As part of the transfer in ownership of the collection system from the Borough of Trainer, DELCORA is responsible for complying with the Consent Order and Agreement between PADEP and the Borough of Trainer, signed 15 August 2005. The Trainer Borough collection system includes the Price Street Pump Station and the Smith Street Pump Station and associated force mains that convey sewage from residences and businesses within Trainer to the WRTP. The terminal force main from these pump stations discharges to a gravity interceptor at the intersection of Price and Mary Streets. This interceptor then flows into the West End Interceptor. The system is shown in Figure 3-5. The Consent Order specifies that Trainer (and now DELCORA) undertake an upgrade of its infrastructure in order to prevent sanitary sewer overflows from occurring. An upgrade of the Price Street Pump Station by fully replacing the force main and upgrading the pumping capacity of the station are explicitly required by the

CHESTER CREEK

Chester Creek
West Interceptor

Chester Creek
East Interceptor

Booth Street
Interceptor

Penn Street
Interceptor

West End
Interceptor

Dock Street
Extension

Edgmont
Interceptor

Delaware River
Interceptor

Western Regional
Treatment Plant (WRTP)

2nd Street
Interceptor

Chester
Pump Station

Ridley Creek
Interceptor

RIDLEY CREEK

PS

Recommended
Force Main

DELAWARE RIVER

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LEGEND

- Interceptors
- Industrial
- Commercial
- Residential
- Open
- Recommended Force Main
- PS Pump Station

Location Map

0 750 1,500 3,000

Feet

WESTON SOLUTIONS

DELCORA

Delaware County Regional Water
Quality Control Authority (DELCORA)

Long Term CSO Control Plan
City of Chester Combined Sewer System

Figure 5-3
Recommended Rivertown
Force Main Alignment

Consent Order. The no-action alternative is not considered an option for the Price Street Pump Station and force main because of the Consent Order.

DELCORA has accomplished the following tasks, including some Milestone Events from the Consent Order:

1. Physical inspections of the Smith Street and Price Street Pump Stations (8/23/05).
2. Development of a Sewer Inspection Program and Specifications (9/8/05).
3. Smith Street Force Main Alternatives Analysis (10/13/05).
4. PADEP Progress Report (9/13/05).
5. Flow metering program initiated on 1 September 2005, scheduled to continue through December 2005.

Alternative alignments for replacement of the Smith Street force main have been evaluated by DELCORA. A total of five alternatives were evaluated:

Alternative 1: Gravity Sewer, Smith Street to Marcus Hook Borough (MHB) Pump Station.

Alternative 2: Force Main, Smith Street to MHB Pump Station.

Alternative 3: Force Main, Smith Street to Gravity Sewer to DELCORA's Marcus Hook Pump Station.

Alternative 4: Force Main, Smith Street to DELCORA's Marcus Hook Pump Station.

Alternative 5: Force Main, Smith Street to connection at Price and Mary Streets.

Alternative 6: No Action

5.3.3 CSO Outfall Reconstruction

Combined sewer outfall reconstruction, in conjunction with riverfront development in the City of Chester, is being evaluated as a means to increase system efficiency and reduce the impact of combined sewer discharges on water quality in the Delaware River. Although not related to the WRTP planning area conveyance system, the combined sewer outfall reconstruction is included in this *Act 537 Plan Update* because it is currently being planned. Reconstruction and

consolidation of two or more CSOs may also be necessary to remove physical obstacles to redevelopment in the Rivertown area and elsewhere.

5.4 ALTERNATIVES TO DEVELOP INFRASTRUCTURE TO SERVE GROWTH AREAS

In Section 4.4, projections of residential, commercial, and industrial population growth were used to estimate the demand for public treatment facilities within WRTP service areas or potential service areas. Refer to Table 4-3, which shows that planned projects may generate approximately 4.45 MGD of average daily wastewater flows. Currently the WRTP receives an average flow of approximately 34.8 MGD. If an additional 4.45 MGD of flow were to be conveyed to the WRTP, as projected, average flows would increase to approximately 39.25 MGD. With the increase in flow, treatment capacity may be maximized through I&I elimination programs in older service areas. However, in new service areas, a majority of the additional capacity will likely be obtained by expanding existing facilities or developing new facilities. Municipalities that connect developing areas to the DELCORA collection system will be responsible for constructing local conveyance structures and will update their individual Act 537 Plans to plan for those systems.

5.4.1 Increase Conveyance and Treatment Capacity at Existing Facilities

The focus of this *Act 537 Plan Update* is to support a re-rate of the WRTP from 44 MGD to 50 MGD. The capacity of the plant to receive 50 MGD has been previously demonstrated. Therefore, additional treatment capacity alternatives are not relevant to this *Act 537 Plan Update*. Alternatives to maximize the capacity of the existing collection facilities were discussed in Section 5.3.

5.4.2 Increase Conveyance and Treatment Capacity with New Facilities

Another alternative to address capacity limitation problems is the construction of new collection systems. As noted previously, alternatives to provide additional treatment capacity are not relevant to this *Act 537 Plan Update*. Section 4.4 discusses significant on-going and expected growth in the WRTP service areas or potential service areas, which may require additional conveyance capacity. Increasing conveyance capacity with new facilities, such as interceptors, pump stations, and force mains, is an alternative. However, this alternative involves large capital

expenditures and is not recommended because existing capacity within the interceptor and force main systems is sufficient to meet demand with the limited improvements noted in Section 5.3. A decision not to tie flows from the proposed Rivertown development in to the Delaware River Interceptor was made based on DELCORA's observations of full flow conditions in that interceptor. A small pump station and separate force main connection to the WRTP will preserve capacity in the Delaware River Interceptor.

Municipalities containing developing areas that may connect to the existing collection system will do so by updating their individual Act 537 plans. Each municipality, either individually or in combination, will be responsible for developing the collection system and connection to the main interceptors that convey flow to the WRTP.

5.4.3 No Action

The final option addressing the issues of developing infrastructure to serve growth areas is to do nothing and require developers to provide adequate disposal for their developments.

6. EVALUATION OF ALTERNATIVES

6.1 CONSISTENCY WITH EXISTING ENVIRONMENTAL REGULATIONS AND POLICIES

Selected alternatives to maintain the conveyance system serving the WRTP have been evaluated for consistency with respect to the following plans and policies:

1. Section 208 of the Clean Water Act Comprehensive Water Quality Management Plan (COWAMP) – Consistency with this plan could not be verified because it is out of print. It is unlikely that the proposed conveyance system upgrades are inconsistent with the COWAMP Plan.

2. Annual Chapter 94 Report – The proposed CSO reconstruction/rehabilitation and the WRTP re-rate to 50 MGD are contained in the 2004 Municipal Wasteload Report.

3. Previous plans developed under Title II of the CWA or Titles II and VI of the Water Quality Act of 1987 – Title II of the Clean Water Act contains provisions for federal construction grants for treatment works. The Water Quality Act of 1987 authorized the stormwater NPDES program and encouraged states to implement non-point source pollution controls (under Section 319). Municipal wastewater construction is addressed under Titles II and VI of this Act. Title II is the federal construction grants program that was replaced by Title VI, the state revolving funds loan program. DELCORA received a Penn Vest loan for the CDPS force main diversion project. The WRTP was funded by a federal construction grant in the 1970's.

4. Comprehensive Plans – This *Act 537 Plan Update* is consistent with municipal comprehensive plans within the WRTP service area.

5. Antidegradation Requirements in PA Code, Title 25, Chapters 93, 95, and 102 – PADEP has approved this re-rate design in a letter dated 21 August 2003. The design for the re-rate of the WRTP from 44 to 50 MGD is in conformance with standards set forth in Chapter 95. Copies of the re-rate approval letter from PADEP and the WRTP design document titled Western Regional Treatment Plant Re-Rate to 50 MGD are presented in Appendix A. The contractor performing replacement of the inadequately sized

interceptors will be required to obtain a Chapter 102 Erosion and Sedimentation Control Permit for the construction activity.

6. State Water Plan – The improvements to the collection system that are proposed in this *Act 537 Plan Update* will not affect flooding problems identified in the 1983 State Water Plan. The State Water Plan is currently being re-written, however conflicts due to the proposed upgrades are not anticipated.

7. Pennsylvania Prime Agricultural Land Policy – There is no opportunity for agricultural use of the urban and suburban land locations of the proposed upgrades to the WRTP collection system.

8. County Stormwater Management Plans – Chester Creek has an approved Stormwater Management Plan that covers a portion of the WRTP service area. The proposed upgrades to the collection system do not involve any land development or changes to stormwater management.

9. Wetland Protection – The proposed upgrades to the collection system will not involve any impacts to wetlands identified on the National Wetland Inventory (NWI) map of the service area.

10. Protection of rare, endangered, or threatened plant and animal species. – Pennsylvania Natural Diversity Index (PNDI) requests have been submitted for the Smith Street and Price Street force mains and the Price Street Pump Station in Trainer Borough, the Booth Street Interceptor, and the Rivertown force main. Copies of the PNDI search documents and the response letters from the Department of Conservation and Natural Resources Bureau of Forestry are contained in Appendix D of this plan update. There are no conflicts regarding the PNDI searches.

11. Historical and Archaeological resources protection – Cultural Resources Notices were submitted to the Bureau of Historic Preservation for the Smith Street and Price Street force mains and the Price Street Pump Station in Trainer Borough, the Booth Street Interceptor, and the Rivertown force main. The response letters from the Bureau of Historic Preservation are attached to Appendix E of this plan update. There are no conflicts regarding the Cultural Resources Notices.

6.2 EVALUATION OF ALTERNATIVES TO ADDRESS THE CONDITION OF EXISTING PUBLIC INFRASTRUCTURE

6.2.1 Interceptor Capacity Upgrade Alternatives

Interceptor capacity upgrades require a significant financial commitment when compared to the cost of recovering capacity that has been lost to I&I in older systems. Eliminating I&I has the benefit of extending the life of the existing systems. Upgrading the interceptors in locations that have been identified as having inadequate capacity to convey projected peak flows could be considered; however, it is more likely that unforeseen new flows will be conveyed to the WRTP via existing or new force mains. This section presents an evaluation of the selected alternative for maintaining conveyance capacity to the WRTP for each location in the gravity interceptor system that was identified as having limited capacity.

6.2.1.1 Booth Street Interceptor

A 1,320-foot section at the upstream end of the Booth Street Interceptor is simulated to flow under pressure under future maximum flow conditions because the small-diameter pipe is not able to accommodate the additional flows from the built out Sunfield Development. The selected alternative to increase capacity in this section is to upgrade the Feltonville Pump Station by increasing pumping ability and replace the existing 8- and 10-inch sections of pipe with 15-inch diameter pipe. This alternative will be implemented by the developer during construction of the project. The No Action alternative has been selected for the Booth Street Interceptor until construction of the built-out Sunfield Development.

6.2.1.2 Chester Creek West Interceptor

A 444-foot section at the upstream end of the Chester Creek West Interceptor is simulated to flow at 100% of capacity during current maximum as well as future maximum flow conditions due to the diameter of the pipe and the flat nature of the system at that location. This section of pipe carries the flow from Upland Borough and there are no significant new flows expected. The selected alternative is No Action since no significant increase in flow is expected. A supplemental report to this *Act 537 Plan Update* containing an evaluation of options to increase the interceptor capacity will be submitted to PADEP if required.

6.2.1.3 Chester Creek East Interceptor

A 540-foot section at the upstream end of the Chester Creek East Interceptor is simulated to flow under pressure during existing and future maximum flow conditions because the small-diameter pipe is not able to accommodate peak flows or additional flows from Crozer Hospital. A study is recommended to identify specific actions to reduce I&I in the Chester Creek East Interceptor.

6.2.1.4 Ridley Creek Interceptor

A 3,640-foot section of 21-inch pipe near the upstream end Ridley Creek Interceptor is simulated to flow under pressure during current and future maximum flow conditions, however, no manholes are simulated to surcharge above the rim. As discussed in Section 5.3.1.4, the No-Action scenario has been selected for this section regarding replacement of this interceptor. A flat slope condition is the primary cause of pressure flow in the segment. I&I abatement in separate areas, to be implemented within the next 5 years, in separate areas is recommended to maximize the efficiency of the system. An I&I study is recommended to identify specific actions to reduce I&I in the Ridley Creek Interceptor.

6.2.2 Correct I&I Problems

I&I studies should be prepared for older separate systems in the areas served or potentially served by the WRTP. These studies would identify areas where I&I problems reduce capacity in the systems and also prioritize areas where remedial action should be taken to reduce I&I. Reduction of I&I is beneficial in the following ways:

- Increased sewer infrastructure capacity for other uses.
- Reduced treatment and operations and maintenance costs associated with treating the I&I flow.
- Reduction or elimination of potential public health hazards resulting from sewage overflows in areas with overtaxed facilities.

Public education and implementation of an I&I monitoring program are institutional measures that can be employed to reduce I&I problems. One of the foremost advantages to implementing a corrective action plan is that the environment is protected from the leakage into the groundwater, and the potential for contamination of the waterways through sewer overflows is decreased. Not only is the environment protected, but the overall health and welfare of the public is protected.

6.2.3 Trainer Borough Collection System Upgrades

A new Price Street Pump Station and force main with increased capacity is the selected alternative because these actions are required by the Consent Order. In addition, the Smith Street force main which discharges at Mary Street will be replaced in its entirety.

Replacement of the Smith Street Pump Station is not planned because the existing pumps at the Smith Street Pump Station are considered adequate. The selected alternative is to replace the force main from the Smith Street Pump Station to discharge to the gravity interceptor at Mary Street. This alternative includes the construction of approximately 4,000 lf of force main that will cross Stoney Creek along Post Road and continue east to Price Street. The sewer alignment will then follow Price Street south and discharge to the gravity interceptor at Mary Street (the existing discharge location). The proposed layout includes a creek crossing.

This alternative will require approximately 500 lf of clearing and grubbing. No additional easements would be required for this route because it would fall within existing easements. The alignment runs along Post Road (Rt. 291) and would, therefore, require extensive traffic control and a construction sequence that will not inhibit traffic flow. Construction activities should be coordinated with Trainer Borough to finish roadway disturbances prior to the planned restriping of Route 291. This road is planned to be restriped to include a bike lane.

6.2.4 CSO Outfall Reconstruction

Combined sewer outfall reconstruction requires a significant financial commitment; however, the costs can be shared with entities seeking to develop riverfront properties. Depending on the eventual plans for the Rivertown development, it may be necessary to re-locate or combine one or more of the CSOs currently located within the project area. Such modifications would need to be evaluated on a case-by-case basis. DELCORA is currently evaluating potential improvements to several outfalls in the Riverbridge area, including relocation and extension. Additional details on the development scenarios are provided in the *Riverfront Development Study, City of Chester, Summary Report*, dated April 2005.

6.3 EVALUATION OF ALTERNATIVES TO DEVELOP INFRASTRUCTURE TO SERVE GROWTH AREAS

6.3.1 Increase Conveyance and Treatment Capacity with Existing Facilities

Before constructing new treatment facilities, it is usually most economical to maximize the capacity of existing facilities. Options to maximize existing conveyance capacity would include an I&I elimination program and sewer cleaning program. I&I elimination programs typically provide three benefits: reduced treatment costs, extended service life of the collection system, and increased available treatment capacity at existing facilities. These benefits often exceed the cost of repairs.

The focus of this *Act 537 Plan Update* is to support a re-rate of the WRTP from 44 MGD to 50 MGD. The capacity of the plant to receive 50 MGD has been previously demonstrated. Therefore, additional treatment capacity alternatives are not relevant to this *Act 537 Plan Update*.

A SewerCAD model of the collection system is described in Section 3.2 of this report. The SewerCAD simulation of the system indicates that some areas of the gravity interceptor are nearing full capacity; however, there is additional capacity to accept flow in the Chester force main.

6.3.2 Increase Conveyance and Treatment Capacity with New Facilities

Flows were projected for all known planned development in the WRTP service area and have been input to the SewerCAD simulation for the existing interceptors and force mains. The simulation shows that the existing conveyance system is adequate for projected peak flows upon implementation of upgrades in selected areas and construction of a new force main connection to the WRTP to service the planned Rivertown development.

6.3.2.1 Delaware River Interceptor/New Rivertown Force Main

The planning effort for treating wastewater from the proposed Rivertown development includes construction of a separate force main to convey flow directly to the WRTP. This alternative is recommended to avoid adding additional flow to the Delaware River Interceptor. Figure 5-2 shows the recommended alignment of the new force main.

6.3.3 No Action

The no action alternative would ignore the fact that areas with older sewer lines are experiencing significant I&I, which can cause sewer mains to take on water and/or cause potential leaking to groundwater sources. Doing nothing means that municipalities and conveyance authorities will continue to collect and pay to convey and treat excess water in their sewer systems. Existing problems continue to grow and will be more expensive to remediate in the future.

6.4 ECONOMIC EVALUATION

6.4.1 Correct I&I Problems

Physical corrective actions include, but are not limited to the following items, which are listed in approximate order of cost, with regular sewer cleaning being the least expensive:

- Regular sewer cleaning.
- Regular inspection and maintenance.
- Manhole inserts.
- Roof leader/sump pump disconnects.
- Manhole frame repairs.
- Slip lining of stream crossings.
- Chemical grouting.
- Manhole repairs.
- Slip lining of other segments.
- Disconnect inlets.
- Sewer replacement.

System repairs that can be identified through a monitoring program require lower capital costs than replacing the system. Other advantages associated with correction of identified problems include extended service life of the system and reduced annual conveyance costs, including increased return on investment made to repair the system.

The disadvantages to repairing the system include capital costs, some public resistance to the expenditures to repair the system, and temporary public inconvenience while repairing the system. However, when compared to the high monetary and public health costs and inconvenience associated with failure of the systems, repair costs seem reasonable.

The municipal-specific economics of repair work will need to be developed as part of any I&I study and considered when preparing corrective action plans. Economic analyses produced as part of the extensive I&I studies that have been previously conducted in eastern Delaware County clearly indicated a positive return on investment based solely on reduced treatment costs. Additional savings can be garnered through reduced need for additional treatment facilities.

Economic evaluations are not provided for recommendations that involve studies and further analyses.

6.4.2 Increase Conveyance and Treatment Capacity with Existing Facilities

When compared to constructing new conveyance and treatment facilities, it is usually most economical to maximize the capacity of existing facilities. This section explains present worth analyses for the selected alternatives to upgrade the conveyance capacity to the WRTP within the next 5 years. Note that these cost estimates, compiled from the RS Means Building Construction Cost Data for 2004 and other sources, are for budgetary planning purposes and are not design cost estimates.

6.4.2.1 Booth Street Interceptor

The cost estimates for the Booth Street Interceptor improvements are summarized in Table 6-1. The detailed cost estimates are presented in Appendix F.

Table 6-1
Summary of Cost Estimates for Booth Street Interceptor

Option	Total Cost
1: Improve pump station and install parallel pipe	$2,530,033
2a: Improve pump station and replacement of pipe with larger pipe using traditional trenching methods	$2,168,423
2b: Improve pump station and replacement of pipe with larger pipe using pipe bursting methods	$2,007,273

At this time, the selected alternative for the Booth Street Interceptor is No Action. The cost estimates in Table 6-1 have been developed for use when the Sunfield Development is constructed. The most cost-effective option is 2b, to replace the existing sewer pipe with a larger

pipe using a pipe bursting method. The developer will be required to fund improvements to the pump station and interceptor as a condition of connection to the system.

6.4.3 Increase Conveyance and Treatment Capacity with New Facilities

New construction to create additional capacity to serve growth areas is associated with a very high capital cost. With the high cost comes major public resistance to the expenditure and major inconvenience as streets and stream corridors are opened up to either replace or add components parallel to the existing system. The Rivertown force main is the only new facility that is proposed to convey planned peak flows to the WRTP.

6.4.3.1 Rivertown Force Main

Budgetary planning cost estimates for the recommended force main are presented in Table 5-1 of the *Riverfront Development Study, City of Chester, Summary Report*, dated April 2005. The cost estimate includes the cost of the pump station as well as the force main but excludes the cost of acquiring land for the pump station. The estimated planning cost is $1.7 million. Note that this is not a selected alternative because development plans are incomplete. Once an alternative is selected, a special study by the developer will be proposed to determine the appropriate course of action.

6.4.4 Trainer Borough Collection System Upgrades

Budgetary planning cost estimates for upgrading the Price Street Pump Station and replacing the force main are estimated to be $1.1 million. A cost estimate for the Price Street Pump Station upgrade and force main replacement is included in Appendix F.

Budgetary planning cost estimates were prepared for each alternative for upgrading the Smith Street force main. Estimated costs range from approximately $1,115,000 for Alternative 3 to $1,348,000 for Alternative 1. The estimated costs for each alternative are summarized in Table 6-2 below with supporting details included in Appendix F.

Table 6-2
Cost Estimates for the Smith Street Force Main Alternative Alignments

Alternative	Description	Cost
1	Gravity Sewer Smith Street to Marcus Hook Pump Station	$1,348,133
2	Force Main Smith Street to Marcus Hook Pump Station	$1,200,165
3	Force Main Smith Street to Gravity Sewer to DELCORA Pump Station	$1,115,103
4	Force Main Smith Street to DELCORA Pump Station	$1,164,095
5	Force Main Smith Street to Mary Street	$1,159,403

Potential construction cost savings to be gained from Alternative 3 are relatively small, and may be offset by the costs associated with the institutional agreements that would be necessary between DELCORA and Marcus Hook Borough. In addition, the time required to negotiate such agreements could impact the schedule for completing the milestone tasks under the Trainer Borough Consent Decree. Therefore, Alternative 5 is the recommended alternative.

6.4.5 CSO Outfall Reconstruction

Budgetary planning cost estimates for the CSO outfall reconstruction are presented in Tables 5-2A through 5-2D of the *Riverfront Development Study, City of Chester, Summary Report*, dated April 2005. The cost estimate includes the cost of three new manholes, approximately 200 linear feet of 36- or 48-inch ductile iron pipe, and outfall piling per outfall. The estimated planning costs range from $297,500 per outfall (for outfalls 3 through 6) to $4,243,500 to complete all 7 potentially affected outfalls. Note that this is not a selected alternative because development plans are incomplete. Once an alternative is selected, a special study by the developer will be proposed to determine the appropriate course of action. The preliminary cost estimates developed for the *Riverfront Development Study* are included in Appendix F of this report.

6.4.6 No Action

The costs associated with doing nothing are minimal in the short term, but long-term repairs that will be required due to system degradation over time will be significant. Costs in the long-term may include those needed to replace much of the system and repair and upgrade system components.

6.5 AVAILABLE FUNDING METHODS

Costs for the Booth Street Interceptor improvements and the Rivertown force main will most likely be shared with or entirely absorbed by the developer. The costs for I&I studies will be appropriations from DELCORA's operating budget. The following list includes other funding sources that are potentially available, but not likely to be used for the projects recommended in this *Act 537 Plan Update*:

- Pennsylvania Economic Development Financing Authority (PEDFA): Tax-exempt and taxable bonds ($400,000 to $10,000,000) to be used to finance land, equipment, working capital, and refinances.

- Industrial Site Reuse Program (ISRP): Grant and low-interest loan financing environmental site assessment and remediation work at former industrial sites.

- Infrastructure Development Program (IDP): Grant and low-interest loan financing (up to $1,250,000) public and private infrastructure improvements.

- New Communities/Enterprise Zone Program: Grants (up to $50,000) to financially disadvantaged communities for preparing and implementing business development strategies within municipal Enterprise Zones.

- Opportunity Grant Program (OGP): Grant funds (no minimum or maximum amounts) to create or preserve jobs within the Commonwealth. Applicable uses include infrastructure and acquisition of right-of-ways.

- The Pennsylvania Infrastructure Investment Authority (PENNVEST): Low-interest (1% or 5%) loans for design, engineering, and construction of publicly and privately owned drinking water distribution and treatment facilities, storm water conveyance and wastewater treatment and collection system improvement projects. PENNVEST administers the Pennsylvania Clean Water State Revolving Fund in conjunction with PADEP. Loans of up to $11 million are offered for one municipality, or up to $20 million for more than one municipality, with terms depending on the useful life of the asset being financed.

- Coastal Zone Management (CZM) Grants: Pennsylvania's CZM Program is funded by annual grants to PADEP by the Office of Ocean and Coastal Resource Management (OCRM), National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. The Commonwealth then manages a grant-in-aid program to provide federal grant funding for planning, design, engineering, and educational and research projects as authorized by the Coastal Zone Management Act of 1972. Generally, a $50,000 grant limit is imposed on any single project and must be equally matched through cash or eligible in-kind sources.

- Growing Greener Grants: The Environmental Stewardship and Watershed Protection Act authorizes PADEP to allocate nearly $547 million in grants for watershed protection, flood protection, and source water protection. Counties, municipalities, and authorities are among the eligible recipients.

- Congressional Grants: The U.S. Congress annually provides earmarked funds for targeted programs to communities for the construction of drinking water, wastewater, and stormwater infrastructure and for water quality protection. In recent years, these grants have been accompanied by a cost-share requirement whereby 45% of a project's cost is the responsibility of the community or entity receiving the grant (waivers from this requirement are possible if the financial burden on the recipient is too great). For the fiscal year 2005, a total of $309,925,000 was earmarked for such uses; most grant amounts are in the $50,000 to $1,000,000 range. Earmarks are typically requested by a member of Congress at the behest of a local jurisdiction. These are not competitive grants; however, EPA or the designated state agency does have an oversight role.

Additional information on grant programs administered by the Commonwealth is available at the PA Department of Community and Economic Development website, www.INVENTPA.com.

6.6 IMPLEMENTATION ANALYSIS

6.6.1 Interceptor Capacity Upgrade Alternatives

This section includes an implementation analysis of each selected alternative to improve capacity in the existing collection system.

6.6.1.1 Booth Street Interceptor

Upgrades to the Feltonville Pump Station and the Booth Street Interceptor become necessary only upon completion of the Sunfield Development.

6.6.1.2 Chester Creek West Interceptor

Sections of this interceptor (serving Upland Borough) are flowing at 100% capacity during existing peak flow conditions. Reduction of I&I should be a priority since reclamation of capacity will address an existing limitation in the system.

6.6.1.3 Chester Creek East Interceptor

Sections of this interceptor (serving Crozer Hospital) are flowing under pressure during existing peak flow conditions. A siphon rehabilitation project is currently being implemented just downstream of the location of limited capacity. Reduction of I&I should be a priority since reclamation of capacity will address an existing limitation in the system. Further evaluation will include discussion with Crozer Hospital to determine the need for upgrades to the system.

6.6.1.4 Ridley Creek Interceptor

The recommended I&I evaluation of the separate sanitary sewer areas of the Ridley Creek Interceptor should begin within 5 years of approval of this update. I&I abatement actions that are identified by the study can be implemented upon completion of the study.

Currently no continued I&I monitoring program exists in many of the municipalities and no provision is made to reward municipalities for making necessary corrections. Therefore, a recommendation of this report is to provide municipalities with the support necessary to implement a long-term metering program which could ultimately serve as the basis for institutional changes in billing methods which might reward municipalities for implementation of their local I&I plans.

6.6.2 Rivertown Force Main

Construction of a pump station and new force main connection to convey flows from the planned Rivertown Development will be part of the overall site development for the property. A special study will need to be performed by the developer as design and development plans are completed.

6.6.3 Trainer Borough Collection System Upgrades

DELCORA must complete the final design of the Price Street Pump Station upgrade and force main replacement by 22 August 2007. Construction on this project must be completed by 22 August 2008. Design and construction of the rehabilitation of the Smith Street force main is also expected to be completed by 22 August 2008.

6.6.4 CSO Outfall Reconstruction

Combined sewer outfall reconstruction may take place in conjunction with development of the Rivertown Project and other planned riverfront development in the City of Chester. The Riverfront Development Study (WESTON, 2005) provides details on the planned developments for the Chester riverfront. Planned developments, including Rivertown, are projected to be completed within the next 1 to 10 years.

6.7 REQUIRED ADMINISTRATIVE ORGANIZATIONS AND LEGAL AUTHORITY

DELCORA is the established wastewater treatment authority in Delaware County. DELCORA's administrative capabilities and the legal authority are detailed in Section 7 of this report.

7. INSTITUTIONAL EVALUATION

7.1 INTRODUCTION

Sewage facilities planning requires analyses of all of the agreements, contracts, and the legal interrelationships between sewer authorities that provide the framework for support of the various components of the physical sewer infrastructure. The legal interrelationships are particularly important in Delaware County because the area is served by a network of sewer authorities and municipally owned collection systems. The purpose of this section is to present the current legal framework within which these entities operate. This section also provides discussions to evaluate the effectiveness of the sewer authorities; and to make recommendations for modifications or improvements that will help facilitate implementation of the selected alternatives that are summarized in Section 6.

7.2 ANALYSIS OF WASTEWATER TREATMENT AUTHORITIES

7.2.1 DELCORA

DELCORA's charter includes the acquisition, construction, improvement, maintenance, operation, owning, and leasing of the sewer systems and sewer treatment facilities within the DELCORA Eastern and Western Service Areas. DELCORA is served by a nine-member Board of Directors appointed by the Delaware County Council. Day-to-day operations are handled by DELCORA's Executive Director and staff of approximately 110 employees. In April 2002, Delaware County amended DELCORA's Articles of Incorporation to extend its term of existence until January 15, 2052.

7.2.2 Financial and Debt Status

DELCORA has an annual operating budget of over $29 million. In 2004, net assets increased by approximately $3 million, contributing to a total net asset value of approximately $72 million. DELCORA has spent over $120 million in construction since it began operating in 1971. As of 11/30/05, DELCORA had over $170 million in fixed (capital) assets.

7.2.2.1 DELCORA Western Service Area

Within the boundaries of the western service area, DELCORA owns and operates the WRTP and a system of interceptors, pump stations, and force mains used to convey wastewater flows. The WRTP is located at the foot of Booth Street in the City of Chester and serves DELCORA's western service area. The plant, which currently has an approved NPDES permit at 44 MGD, discharges to the Delaware River under NPDES permit number PA 0027103. DELCORA prepared and submitted to PADEP a report, dated February 14, 2003, demonstrating that the WRTP has the physical facility to support a re-rate to 50 MGD; in a letter dated 21 August 2003, PADEP agreed with the assessment (Appendix A). The DELCORA WRTP receives wastewater by means of both a gravity interceptor system and a pressure force main system.

Trainer Borough, Chester Township, Upland Borough, Brookhaven Borough, Parkside Borough, Nether Providence Township, Eddystone Borough, Lower Chichester, and Marcus Hook discharge sanitary and industrial wastewater flows directly to the interceptors leading to the WRTP.

There are 27 regulators within the City of Chester combined sewer system, which, during storm periods, control the rate of flow from the combined sewers to the WRTP. As the flow rates increase, the regulators close, preventing additional flow to the WRTP and allowing for overflow to the receiving waters. The hydraulic system and regulators controlling discharges to the combined sewer outfalls respond rapidly to storm events, essentially routing flows to the outfalls early in the storm events.

The DELCORA pressure force main system serving the WRTP service area includes six pump stations:

- CDPS – Central Delaware County Pump Station (40 MGD capacity, flow split between PSWPC and WRTP).
- CPS – Chester Pump Station (26 MGD capacity; permitted to by-pass flows received above a 30 MGD flow rate during storm periods).
- Broomall St. Pump Station (2.0 MGD capacity).
- 8th Street Pump Station (0.34 MGD capacity).
- Feltonville pump Station (0.29 MGD capacity).
- Eddystone Pump Station (2.0 MGD capacity).

Wastewater discharged from the CDPS is split between flow discharged to the WRTP, and a portion conveyed to the PSWPCP. The flow split from CDPS to the WRTP is currently limited to 13.3 MGD, based on available capacity at the WRTP, and maintained by a motorized control valve.

Three privately-owned pump stations that discharge to the Chester force main are the following:

- KCPS – Kimberly Clark Pump Station (16.5 MGD capacity).
- SOPS – Sun Oil Pump Station (12 MGD capacity).
- MHPS – Marcus Hook Pump Station (2.8 MGD capacity).

SDCA serves Upper Chichester Township and a portion of Bethel Township. SDCA owns and operates a sanitary sewer collection system and two pump stations: Beech Street and Naaman's Creek. Most sewage collected by SDCA is conveyed to DELCORA by Naaman's Creek Pump Station via a tie in to the Sun Oil/Marcus Hook force main. Wastewater from the western portion of Bethel Township that still flows to the City of Wilmington's 90-MGD treatment plant in accordance with an agreement with New Castle County, Delaware, is proposed to be re-directed to the WRTP. Approximately 1.5 MGD of sewage formerly conveyed to the Wilmington Water Pollution Control Plant was diverted to the WRTP in March 2002.

7.2.3 DELCORA's Existing Legal Authority

DELCORA is a municipal authority, originally incorporated under the Municipal Authorities Act of 1945. Delaware County Ordinance No. 2002-1, adopted by the County in April 2002, extends DELCORA's term of existence until January 15, 2052. The Articles of Incorporation give DELCORA the authority to acquire, hold, construct, improve, maintain, operate, own, and lease projects including sewers, sewer systems or parts thereof, and sewerage treatment works. DELCORA is authorized to serve and to contract with individuals, municipal corporations, authorities, and other governmental bodies or regulatory agencies.

7.2.3.1 Implement Wastewater Planning Recommendations

DELCORA has developed Act 537 Plans and Updates for the Eastern and Western Service Areas in Delaware County. The *Act 537 Plan Update* for the Eastern Service Area addressed maximizing the capacity of the existing collection system. One of the recommendations of the

Act 537 Plan for the Eastern Service Area was to complete the construction of the diversion from CDPS to CPS, which was underway at the time the plan was adopted in 2002. The diversion is now completed, which allows a portion of the flow passing through the CDPS to be diverted to the CPS and ultimately to the WRTP. The project aided in maximizing the existing capacity of the Eastern Service Area.

7.2.3.2 Implement Systemwide Operation and Maintenance Activities

As a single regional authority, DELCORA is able to operate and maintain its own facilities (i.e., lines, pump stations, treatment plant) as needs arise. It has a full-time Executive Director, trained professional staff, and a single Board of Directors providing oversight. However, it should be noted that issues still exist regarding implementation of needed improvements in local sewer systems beyond DELCORA's direct control, as well as the issue relating to a lack of incentive to reduce flows in these local collection systems when billing is based on a water bill.

Since DELCORA owns and operates the WRTP, it has legal responsibilities to the Commonwealth of Pennsylvania for the safe and effective operation of its system through its NPDES permit. The permit allows the state and federal government to hold DELCORA accountable for its system and operations. Coupling this with DELCORA's desire to manage treatment costs, it provides strong incentives to maintain its facilities and eliminate I&I.

7.2.3.3 Set Fees and Implement Purchasing Actions

Municipalities within the Western Service Area include Trainer, Marcus Hook, Eddystone, Brookhaven, Parkside, and Upland Boroughs; the City of Chester; and portions of Chester and Nether Providence Townships. Trainer, Marcus Hook, Eddystone, and Brookhaven Boroughs are billed directly based on their pumped, metered flows. Costs associated with conveyance and treatment of these flows is the prorated share of the costs for treatment and pumping at the WRTP. Customers in the City of Chester, Upland and Parkside Boroughs, and in Chester Township are billed directly by DELCORA based on water usage at $3.07/1,000 gallons (as of 2006). Costs for CSO management in the City of Chester are assumed by its residents.

7.2.3.4 Take Enforcement Actions Against Ordinance Violators

Various municipal, conveyance authority, and DELCORA agreements, include provisions that connection of any source of water other than sanitary sewers (i.e., downspouts, sump pumps) is strictly prohibited. Enforcement of these requirements through inspection programs is the responsibility of the municipalities.

7.2.3.5 Negotiate Agreements with Other Parties

DELCORA maintains an agreement with the City of Philadelphia for disposal of portions of the wastewater that is collected in DELCORA-owned interceptors and force mains. DELCORA also maintains agreements with the collection authorities that discharge wastewater to DELCORA's system.

7.2.3.6 Raise Capital for Construction and Maintenance of Facilities

DELCORA has the ability to obtain bonds for construction and maintenance projects. DELCORA can also apply for grants available from PADEP (Growing Greener, CZM) or low-interest loans from PENNVEST.

7.3 INSTITUTIONAL ALTERNATIVES

DELCORA is actively planning for future conditions and currently successfully managing waste water collection and treatment in Delaware County. No need is anticipated for new municipal departments or authorities to implement the technical alternatives proposed in Section 6. DELCORA has a demonstrated history of completing system upgrades and negotiating the agreements necessary to meet increasing demands.

As an option for regionalization of collection and treatment of wastewater, DELCORA provides an example of an efficient, self-sufficient organization that specializes in wastewater treatment and systems management. The advantages and disadvantages of the existing regionalized sewage conveyance and treatment system are as follows:

- Advantages
  - Single layer of management.

- Trained staff and employees specializing in wastewater management and treatment.
- Ability to view projects and their benefits to the County as a whole.
- Accountability for their facilities though the NPDES permit for the WRTP.
- Increased financial stability since costs are spread over a larger area that is less susceptible to neighborhood economic limitations.

- Disadvantages
  - Reduced level of accountability for the operation and maintenance of the components of the system not directly controlled by DELCORA.

7.4 ADMINISTRATIVE AND LEGAL ACTIONS

No incorporation of authorities or agencies will be required to ensure the implementation of the recommended alternatives. Implementation of the alternatives to upgrade the conveyance system will not require adoption of ordinances, regulations, standards, or inter-municipal agreements.

7.4.1 Rights-of-way, Easements, and Land transfers

The only proposed project area that is neither within an existing easement nor owned by DELCORA is a portion of the alignment of the Rivertown force main. An easement will be necessary to cross the trash-to-steam plant property that is located between the proposed pump station and the WRTP. DELCORA has a good working relationship with Covanta (owners of the trash-to-steam facility) and does not anticipate any problem obtaining an easement through this property. The required easement for the Rivertown force main will be formalized during the engineering design. Additional easements will be required for the CSO outfall reconstruction. Location and development of the easements will occur as the property development plans progress.

7.4.2 Adoption of Other Municipal Sewage Facilities Plans

Adoption of other municipal sewage facility plans will not be necessary to implement the proposed upgrades to the conveyance system to the WRTP.

7.5 PROPOSED INSTITUTIONAL ALTERNATIVE

The proposed institutional alternative is for DELCORA to administer the implementation of the upgrades to the conveyance system. This is the best alternative because DELCORA is an existing agency and owns the WRTP and the interceptors that are proposed for upgrade.

7.6 ADMINISTRATIVE AND LEGAL REQUIREMENTS

The necessary administrative and legal activities to be completed and adopted to ensure the implementation of the recommended alternative were reviewed. As the preliminary step in completing most administrative and legal requirements, this *Act 537 Plan Update* should be adopted by all municipalities within the planning area. These municipalities are Newtown, Bethel, Chester, and Upper Providence Townships; Trainer Borough; and the City of Chester. Figure 7-1 shows an example of a resolution for municipal adoption of the *Act 537 Plan Update*.

Figure 7-1
Resolution Adopting the Delaware County Sewage Facilities Plan – Western Plan of Study-WRTP Re-Rate Update

OF THE (Commissioners/Council) OF _____

(Township/Borough), DELAWARE COUNTY, PENNSYLVANIA (hereinafter "the municipality").

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No 537, known as the "Pennsylvania Sewage Facilities Act," as amended, and the Rules and Regulations of the Department of Environmental Protection (Department) adopted thereunder, Chapter 71 of Title 25 of the Pennsylvania Code, require the municipality to adopt an Official Sewage Facilities Plan providing for sewage services adequate to prevent contamination of waters and/or environmental health hazards with sewage wastes, and to revise said plan whenever it is necessary to meet the sewage disposal needs of the municipality; and

WHEREAS the Delaware County Planning Department, acting upon authorization from the Pennsylvania Department of Environmental Protection, did offer assistance to the municipalities in meeting their Act 537 requirements on a sub-County basis; and

WHEREAS, the (Township/Borough) of _____ did by formal resolution dated _____, authorize the County of Delaware to prepare the sewage facilities plan on its behalf; and

WHEREAS, the appropriate municipal officials of the (Township/Borough) have reviewed the findings and recommendations of that plan and find it to conform to applicable zoning, subdivision, other municipal ordinances and plans, and to a comprehensive program of pollution control and water quality management.

NOW, THEREFORE, BE IT RESOLVED THAT THE (Commissioners/ Council) of (Township/Borough) hereby accepts and adopts the "Delaware County Act 537 Sewage Facilities Plan Update – Re-rate of the Western Regional Treatment Plant," prepared by the Delaware County, November 2003, as the official plan for sewage facilities in compliance with the Pennsylvania Sewage Facilities Act of 1966. The (Township/Borough) hereby assures the Department of the complete and timely implementation of the said plan as required by law. (Section 5, Pennsylvania Sewage Facilities Act, as amended).

I, _____, Secretary, _____

(Township/Borough) (Commissioners/Council) hereby certify that the foregoing is a true copy of the (Township's/Borough's) Resolution No. _____, adopted _____, 2006.

AUTHORIZED SIGNATURE TOWNSHIP/BOROUGH SEAL

_____

8. IMPLEMENTATION SCHEDULE

The purpose of this chapter is to provide a framework and schedule for the implementation of the recommended alternatives detailed in Chapter 6 of this document. The recommended alternatives in Chapter 6 best meet the needs of the planning area and provide the most cost-effective method of conveying flow from the municipalities to the WRTP.

8.1 JUSTIFICATION FOR RECOMMENDED ALTERNATIVES

A re-rate of the WRTP to treat 50 MGD has been approved by PADEP. Some proposed upgrades to the conveyance system that have been selected and recommended by this *Act 537 Plan Update* are necessary to deliver flows from growing sectors of the service area to the WRTP. The remaining upgrades are either mandated by the PADEP Consent Order for Trainer Borough, or are necessary to rehabilitate aging systems within DELCORA's existing service area.

8.1.1 Interceptor Capacity Upgrades

A potential upgrade for the Booth Street Interceptor is presented in Chapters 5 and 6 of this document. Chapters 5 and 6 also contain the specifications for upgrades to the Smith and Price Street force mains and the Price Street Pump Station in the Borough of Trainer. Recommendations for restoration of capacity through I&I reduction are included for the Chester Creek East, Chester Creek West, and Ridley Creek Interceptors.

The WRTP has the capacity to treat projected flows from its current service area as well as the planning area municipalities. Projects to improve the capacity in segments of the previously listed interceptors are the most cost-effective means to extend the life of the existing system and treatment facility for the next 10 to 15 years. Operation, maintenance, and administration of the facility are already in place. The proposed interceptor capacity upgrades have minimal environmental impact and all construction activities will be performed in compliance with Chapter 102 erosion and sedimentation control requirements.

8.1.2 CSO Outfall Reconstruction

A program to address CSOs is mandated by PADEP. The physical reconstruction of the regulators is a critical component of DELCORA's CSO mitigation effort. The timing of certain

projects in concert with re-development of river front properties allows for cost sharing and provides the invaluable benefit of enhanced water quality in the Delaware River.

8.1.3 Rivertown Pump Station and Force Main

The Delaware River Interceptor has been identified by DELCORA as flowing at capacity during peak events. For this reason, it is not feasible to direct additional flows from the proposed Rivertown development to the interceptor. Due to proximity, a pump station and direct force main connection are the most cost-effective means to convey projected flows from Rivertown to the WRTP. The pump station and force main will be funded by the developer but operated and maintained by DELCORA.

8.2 CAPITAL FINANCING PLAN

The cost of the proposed projects will be included in DELCORA's capital budget upon approval of this plan. The costs of the CSO rehabilitation projects, the Rivertown Pump Station and Interceptor, and the Booth Street Interceptor (Feltonville Pump Station) will be assumed by the property developers.

8.3 IMPLEMENTATION SCHEDULE

The Trainer Borough collection system upgrades have been initiated and will be completed prior to the deadline of 22 August 2008. The remainder of the proposed projects will be implemented in conjunction with construction of the property redevelopment projects. I&I monitoring and abatement for the Chester Creek East, Chester Creek West, and Ridley Creek Interceptors will be included in DELCORA's operating and/or capital budget and implemented upon appropriation of funds.

9. ENVIRONMENT REPORT

9.1 OVERVIEW OF UNIFORM ENVIRONMENTAL REVIEW PROCESS

The Uniform Environmental Review (UER) process is intended to standardize the process for documenting the environmental effects of proposed drinking water and wastewater infrastructure projects requesting financial assistance from various federal funding sources in Pennsylvania.

The following specific financial assistance programs and agencies can utilize the UER:

- The Clean Water State Revolving Loan Fund (PENNVEST, PADEP, EPA).
- The Drinking Water State Revolving Loan Fund (PENNVEST, PADEP, EPA).
- The RUS Water and Waste Disposal Grant and Loan Program (USDA-RD).
- The Community Development Block Grant Program (DCED, HUD).
- Other Federal Funding Efforts (EPA).

The UER process is intended to streamline and coordinate the environmental review of proposed projects, thereby avoiding major inconsistencies or duplication of effort, particularly where multiple sources of funding are involved. A UER is required only for projects applying for funding under the previously mentioned federal financial assistance programs; for those projects that apply, an Environment Report is required to be completed and submitted to PADEP. DELCORA does not plan to use the previously listed financial assistance programs to contribute to financing of the system improvements that are identified in Section 6 of this *Act 537 Plan Update*. Therefore, a UER is not required for the improvement projects.

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Appendix A
WRTP Re-Rate Report

Pennsylvania Department of Environmental Protection

Lee Park, Suite 6010
555 North Lane
Conshohocken, PA 19428
August 21, 2003

Southeast Regional Office

610-832-6130
Fax 610-832-6133

Mr. Evan R. Andrews, PE
Weston Solutions, Inc.
1400 Weston Way
PO Box 2653
West Chester, PA 19380

Re: DELCORA Western Regional WWTP
Re-rate Proposal

Dear Mr. Andrews:

This is in response to your February 14, 2003 report, detailing the conceptual re-rate of the above referenced facility from 44 MGD to 50 MGD. Your report examines the current performance of the DELCORA Western Regional Waste Water Treatment Plant (WRTP) and discusses various design criteria in comparison with DEP guidelines. Your report suggests that the existing facility is capable of handling average annual flows of 50 MGD without the need for any unit modifications.

Upon review of the data submitted with your report, we have determined that the WRTP is capable of handling flows of 50 MGD using the existing units. This determination is based on the performance data showing acceptable treatment at increased flows. We acknowledge that three design guidelines (primary weir overflow rate, aeration retention time & secondary surface overflow rate) have been minimally exceeded. However, these criteria may be exceeded in certain situations with justification and approval.

Please note, this letter indicates the DEP is in agreement with your evaluation of the WRTP's ability to handle 50 MGD. However, before DELCORA may begin accepting additional flows you must revise your Act 537 plan, amend your NPDES permit and amend your WQM permit. I apologize for the lack of a timely response to your submittal and as a result of internal changes; we anticipate much shorter turn-around times for future submittals to our office. Please contact me at 610-832-6065 if you have any questions.

Sincerely,

Keith Dudley, PE
Chief, Planning & Finance
Water Management

cc: C. Volkay-Hilditch (DELCORA)
R. Breitenstein (DEP Operations)
J. Fields (DEP Permits)
Re

DELAWARE COUNTY REGINAL WATER QUALITY CONTROL AUTHORITY

WESTERN REGIONAL TREATMENT PLANT RE-RATE TO 50 MGD

REPORT ON DEP GUIDELINES

February 14, 2003

Prepared by

WESTON SOLUTIONS, INC.
1400 Weston Way
West Chester, PA 19380

W.O. 05623.017.003

DELAWARE COUNTY REGINAL WATER QUALITY CONTROL AUTHORITY

WESTERN REGIONAL TREATMENT PLANT RE-RATE TO 50 MGD

REPORT ON DEP GUIDELINES

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

DELCORA provides wastewater collection and treatment for its the regional service area. The Western Regional Treatment Plant (WRTP) receives wastewater from part of the region while other flows are pumped to Philadelphia for treatment. The Central Delaware Pump Station (CDPS) has been the focus of an upgrade, including the diversion of most of the flow to the WRTP. Only excess storm related flows will continue to be pumped to Philadelphia.

Strategic planning in the Western Region Service Area has also been initiated to potentially increase the WRTP service area. With the CDPS diversion and potential flow increases from the Western Region, flows to the WRTP are approaching the permitted plant capacity of 44 MGD.

The Process Improvement Project completed in February 2000 identified potential limitations of the existing facilities compared to PADEP Guidelines to handle flows beyond the rated capacity. These potential limitations include:

- Weir overflow rate in the primary clarifiers.
- Retention time in the aeration tanks
- Surface overflow rate (SOR) in the secondary clarifiers

1.2 Report Objectives

The objectives of this report include:

- Presentation of past performance data. Data from the past five years has been summarized showing the excellent performance of the treatment plant.
- Present the projected loadings at 50 MGD. This is the rerate capacity being proposed. The flows and loadings are summarized for the existing and future sources.
- Justify the rerate capacity for 50 MGD for the existing facilities. This is based on the rationale of using selected loading factors as a design basis while other factors may be exceeded without adverse impact on performance. This justification is supported by past performance under peak loads due to facilities being out of service.

2.0 REVIEW OF PAST PERFORMANCE

Three years of operating data have been summarized in Tables 1, 2, and 3. A description of the performance of the WRTP prior to this three-year period is also provided.

2.1 2001/2002 Period

Table 1 presents the monthly performance data for the year ending 30 June 2002. The average rate of flow received at the treatment plant is at least 10% below normal, primarily due to the dry weather conditions. Primary effluent data have been included to show the performance of the primary clarifiers and the loading to the aeration system. Performance for the year was excellent with TSS removal averaging 64.9% for the primary clarifiers and 96% overall. BOD removal across the primary clarifiers was 33.9% and 95% overall. June was the maximum month for flow (29.15 MGD) and BOD load from the primary clarifiers (19,450 lbs/day). The ratios to the annual average were 1.14 and 1.23, respectively.

2.2 2000/2001 Period

Table 2 presents the monthly performance data for the preceding year ending 30 June 2001. The flow was somewhat lower than preceding years, again due to less than normal rainfall. Overall performance for the year was excellent. During the winter months the influent BOD was frequently abnormally high, particularly in December 2000. Instead of being less than 150 mg/l the BOD was often above 200 mg/l. In December five days exceeded 300 mg/l with a maximum reading of 623 mg/l. The BOD was also more soluble during the entire year, resulting in low removal across the primary clarifiers. Maximum BOD load to the aeration system occurred in December at 35,045 lbs/day while the maximum flow month was March at 32.52 MGD. The ratios to the annual average for flow and BOD loading were 1.09 and 1.40, respectively.

2.3 1999/2000 Period

Table 3 presents the monthly performance for the one-year period ending 30 June 2000. Overall performance was generally excellent, although January and February were noticeably impacted by unusual industrial loadings. These loadings contained unidentified constituents that adversely affected the biomass, resulting in reduced TSS and BOD removal. The maximum flow month was September at 39.34 MGD primarily because hurricane Floyd passed through the area. On 16 September the flow for the day was 71.91 MGD with a peak rate of 99.00 MGD recorded. The following day saw 61.99 MGD with a peak of 79.00 MGD. The maximum BOD loading to the secondary system was 40,965 lbs./day during February. The ratios to the annual average were 1.18 and 1.68 for flow and BOD loading, respectively.

2.4 1997/1999 Period

Performance during this two-year period was excellent with average removals of more than 96% for both TSS and BOD. The flow rate averaged just under 30 MGD with maximum monthly rates of 33.60 and 33.90 MGD. The ratios to the annual average were 1.14 and 1.14, respectively.

Table 1: Monthly Performance Summary 2001/2002

Month	Flow, MGD	TSS					BOD					
		Influent (mg/l)	Primary Effluent (mg/l)	Percent Removal	Final Effluent (mg/l)	Percent Removal	Influent (mg/l)	Primary Effluent (mg/l)	Percent Removal	Primary Effluent (lb/day)	Final Effluent (mg/l)	Percent Removal
Jul	27.24	130	54	58.5	4.2	96.6	99	68	31.3	15,450	5.9	94.1
Aug	25.82	134	53	60.4	5.6	95.5	114	80	29.8	17,225	6.7	94.3
Sep	24.23	143	55	61.5	4.8	96.6	121	80	33.9	16,165	4.9	95.8
Oct	23.06	178	66	62.9	4.7	97.0	112	68	39.3	13,080	3.1	97.0
Nov	23.69	173	43	75.1	5.2	96.9	113	62	36.3	14,225	4.2	96.2
Dec	24.01	194	52	73.2	6.1	96.6	138	74	46.4	14,820	5.3	95.8
Jan	25.31	145	72	50.3	6.9	95.1	104	85	18.3	17,940	8.6	91.6
Feb	24.13	143	51	64.3	5.0	96.2	111	81	27.0	16,300	3.4	96.7
Mar	26.72	148	58	60.8	7.2	95.1	103	72	30.1	16,045	4.0	95.9
Apr	26.48	194	44	77.3	6.5	96.5	120	60	50.0	13,250	5.9	94.6
May	28.15	130	48	63.1	4.4	96.5	102	68	33.3	15,965	4.1	96.1
June	29.15	130	49	62.3	8.4*	93.5*	112	80	28.6	19,450	10.7	90.4
Avg.	**25.67**	**154**	**54**	**64.9**	**6.1**	**96.8**	**112**	**74**	**33.9**	**15,825**	**5.6**	**95.0**

Maximum month for flow and BOD load to aeration system was June 2002.

*14 June was omitted. Mechanical failure resulted in Final Effluent TSS =193 mg/l

To convert mg/l to lb/day multiply the mg/l value by 8.34 times the flow (MGD) and the product is lb/day.

Table 2: Monthly Performance Summary 2000/2001

Month	Flow, MGD	TSS					BOD					
		Influent (mg/l)	Primary Effluent (mg/l)	Percent Removal	Final Effluent (mg/l)	Percent Removal	Influent (mg/l)	Primary Effluent (mg/l)	Percent Removal	Primary Effluent (lb/day)	Final Effluent (mg/l)	Percent Removal
Jul	30.71	191	62	67.5	3.9	98.0	101	84	16.8	21,515	3.0	97.0
Aug	29.13	113	89	21.2	3.8	96.6	98	90	8.2	21,865	3.8	96.1
Sep	31.03	145	86	40.7	6.9	95.2	90	89	0.0	23,030	5.0	94.4
Oct	27.32	118	50	57.6	4.3	96.4	60	68	----	15,495	2.7	95.5
Nov	27.23	139	64	54.0	6.9	95.0	133	115	13.5	26,115	6.5	95.1
Dec	29.18	146	61	58.2	12.0	90.9	198	144	27.3	35,045	12.0	94.3
Jan	28.70	160	60	62.5	12.2	91.1	146	127	13.0	30,400	16.7	89.6
Feb	30.30	117	63	46.2	12.7	88.8	139	123	11.5	31,080	16.6	90.5
Mar	32.52	111	99	10.8	7.6	92.9	129	102	20.9	27,665	8.8	93.0
Apr	29.98	129	84	34.9	5.3	95.5	106	86	18.9	21,505	5.1	94.8
May	30.37	160	79	50.6	9.8	93.9	126	102	19.0	25,835	9.3	93.3
June	31.63	150	74	50.7	5.5	96.3	114	79	30.7	20,840	6.5	94.8
Avg.	**29.84**	**140**	**73**	**47.9**	**7.6**	**94.6**	**120**	**101**	**15.8**	**25,030**	**5.1**	**95.8**

Maximum month for flow was March and maximum BOD load to aeration system was December 2000.

To convert mg/l to lb/day multiply the mg/l value by 8.34 times the flow (MGD) and the product is lb/day.

Table 3: Monthly Performance Summary 1999/2000

Month	Flow, MGD	TSS					BOD					
		Influent (mg/l)	Primary Effluent (mg/l)	Percent Removal	Final Effluent (mg/l)	Percent Removal	Influent (mg/l)	Primary Effluent (mg/l)	Percent Removal	Primary Effluent (lb/day)	Final Effluent (mg/l)	Percent Removal
Jul	30.96	145	40	72.4	3.3	98.0	111	65	41.4	16,785	4.8	95.4
Aug	32.43	144	47	67.4	4.5	96.7	113	70	38.1	18,835	4.8	95.6
Sep	39.34	131	45	65.6	12.5	91.7	100	71	29.0	23,295	9.0	90.5
Oct	33.08	120	61	49.2	6.0	95.0	85	58	31.8	16,000	5.0	93.4
Nov	31.09	141	56	60.3	6.0	95.4	107	94	12.1	24,375	5.0	95.7
Dec	31.43	149	78	47.7	8.0	93.7	106	84	20.8	22,020	5.0	94.8
Jan	31.58	155	87	43.9	13.5	91.3	135	96	28.9	25,285	17.0	87.4
Feb	34.59	112	90	19.6	21.7	80.6	146	142	2.7	40,965	23.4	81.2
Mar	37.90	97	96	0.0	11.0	88.7	96	79	17.7	30,345	5.2	94.6
Apr	34.17	124	63	49.2	8.3	90.1	105	89	15.2	24,510	5.6	93.7
May	31.87	143	88	36.4	5.2	96.4	111	107	3.6	28,440	4.2	96.2
June	31.57	168	65	61.3	4.7	97.2	128	84	34.4	22,115	3.9	97.0
Avg.	**33.33**	**136**	**68**	**50.0**	**8.7**	**93.6**	**112**	**87**	**22.3**	**24,420**	**7.7**	**93.1**

Maximum month for flow was September and maximum BOD load to aeration system was February 2000.

3.0 50 MGD RERATE DESIGN BASIS

Table 4 presents projected flows and BOD loadings for currently identified customers and service areas with an expansion capacity of 3.30 MGD. This brings the total flow to 50.0 MGD. This is considered to be the maximum monthly average flow for rerate evaluation. Data for existing customers, service area, and CDPS are based on recent monitoring records. The maximum TSS and BOD concentrations for CDPS were selected based on typical values for domestic wastewater. Flows in excess of 12 MGD received at this station will be pumped to Philadelphia. Flow and BOD for future industrial customers were taken from their applications for service while TSS levels were assumed to equal the respective BOD levels. Future domestic flows were assigned TSS and BOD levels of 250 mg/l.

Maximum BOD loadings from Kimberly-Clark (K-C) and Sun Oil are allowed under current permits while the Chester Service area maximum loading was based on an analysis of monitoring data. Maximum BOD loading is more critical than flow for the design of secondary treatment. Furthermore, analysis of monitoring data shows peak BOD loadings generally do not occur on the days with maximum flow.

Peaking factors for future industrial customers were based on their applications for service, while future domestic flows were assigned a peaking factor of 1.5 for BOD loading. The peaking factor for the combined sources is 1.76. The maximum BOD loading is considered to be a conservative value for this large system of diverse sources with combined sewers. More than half the loading is from industrial sources and the variability of each is independent of all the other sources. The domestic sources, however, tend to be influenced by the same factors such as time of day and rainfall. Therefore, peak loadings from all sources are highly unlikely to occur at the same time.

TABLE 4: PROJECTED FLOW/LOADINGS FOR 50 MGD RERATE

Source	Flow (MGD)	TSS (mg/l)	BOD (mg/l)	BOD Load (lb/day)	Peak Factor	Max BOD (lb/day)
Kimberly Clark	11	110	82	7,500		22,000
Sun Oil	7	240	343	20,000		31,900
Chester Service Area	14	115	47	5,460	1.96	10,702
CDPS, average	10	170	170	14,178		
CDPS, maximum	12	250	250			20,850
Liberty Electric	0.6	100	100	500	2	1,001
SDCA	2.3	250	250	4,796	1.5	7,192
Florida Power and Light	1.0	100	100	834	2.4	2,002
Upper Providence	0.75	250	250	1,564	1.5	2,346
Expansion	3.30	250	250	6,880	1.5	10,320
Re-rate Total	**50.0**	**159**	**148**	**61,712**		**108,314**

4.0 DESIGN CRITERIA FOR PRIMARY CLARIFIERS

The design criteria for primary clarifiers from the DEP guidelines are presented below with a comparison of the guideline value and the value at the re-rate capacity of 50 MGD.

Table 5: DEP Guidelines for Primary Clarifiers

Parameter	Guideline Value	Value at 50 MGD	Comment
62.1 Dimensions (minimum lengths and depths)	Provide	Provided	**Guideline Achieved**
62.21 Surface Overflow Rate (SOR)			
At Max. Monthly Average Flow	1,000 gpd/ft^2	969 gpd/ft^2	**Guideline Achieved**
At Peak Hourly Flow	2,500 gpd/ft^2	2,034 gpd/ft^2	**Guideline Achieved**
62.3 Inlet Structures to provide even flow distribution	Provide	Provided	**Guideline Achieved**
62.4 Drains to provide complete dewatering	Provide	Provided	**Guideline Achieved**
62.5 Bypasses for individual tanks	Provide	Provided	**Guideline Achieved**
62.6 Anti-flotation devices to prevent lifting of empty tanks	Provide	Provided	**Guideline Achieved**
62.7 Freeboard – minimum value	12 inches	Provided	**Guideline Achieved**
63 Weirs			
63.1 Weirs adjustable for leveling	Provide	Provided	**Guideline Achieved**
63.2 Locate to optimize hydraulic detention time	Provide	Provided	**Guideline Achieved**
63.3 Design Rate	15,000 gpd/ft	17,857 gpd/ft	Discussed Below
63.4 Weir troughs design requirements	Provide	Provided	**Guideline Achieved**
63.5 Submerged surfaces requirements	Provide	Provided	**Guideline Achieved**
64 Sludge and sum removal requirements (8 items)	Provide	Provided	**Guideline Achieved**
65 Protective and service facilities requirements (3 items)	Provide	Provided	**Guideline Achieved**

4.1 Primary Clarifier Design Factors

The principal design factor for sizing primary clarifiers is Surface Overflow Rate (SOR). For primary clarifiers the suggested rates are 1,000 gpd/ft^2 at the maximum monthly flow rate (50 MGD), or 2,500 gpd/ft^2 for peak hourly flow rate. With a total tank area of 51,624 ft^2 the SOR is 969 gpd/ft^2 at 50 MGD. At the maximum daily flow of 105 MGD the maximum SOR is 2,034 gpd/ft^2.

SOR is in fact a settling velocity such that when the DEP guideline rate of 1,000 gpd/ft^2 average flow is reduced to units in their simplest form it becomes 133.7 ft/day, or 5.57 ft/hr. This is a rate that will remove essentially all the settleable solids from the wastewater.

For an ideal clarifier SOR is the defining settling rate such that all particles having this settling rate or less are completely removed. Factors that may reduce the performance from the ideal include turbulence (especially where the flow enters the tank), wind and density currents, and scouring velocity.

There are eight primary clarifiers at the WRTP and each has weir lengths of 350 feet for a total of 2,800 feet. At a design flow of 50 MGD this results in a weir flow rate of 17,857 gpd/ft compared to the DEP guideline rate of 15,000 gpd/ft.

Weir loading rates are presented in Section 63.3 of the Guidelines. The purpose of this parameter is to limit the approach velocity to the weirs and thereby reduce the tendency to sweep solids out of the tank. This factor is generally considered to be of minor importance in the performance of a settling tank. WEF MOP No. 8 states, "Weir rates have little effect on the performance of primary [clarifiers], especially with side wall depths in excess of 12 feet". These tanks are 8.75 to 10.25 feet deep, but the weir rate is low compared to the horizontal flow velocity. The weirs occupy approximately 38 feet of the tank length, four times the tank depth. The resulting rise rate to the weirs is therefore about one-quarter the horizontal flow velocity that would tend to scour settled solids from the bottom of the tank and prevent their deposition. Additional weir length would therefore provide very little benefit in counteracting this tendency. The weir rate at design flow is 17,857 gpd/ft compared to the Guideline rate of 15,000 gpd/ft

4.2 Performance During High Loadings

During August of 1999 one-half the primary clarifiers were taken out of service for cleaning and maintenance. For this month the average daily flow was 32.43 MGD with a maximum daily flow of 53.79 MGD. The peak flow rate on the maximum day was 96.00 MGD. Performance for the month and maximum day is summarized is summarized in Table 6 below.

Table 6: Primary Clarifier Performance August 1999

Parameter	Month		Maximum Day	
	TSS	BOD	TSS	BOD
Influent (mg/l)	144	113	185	83
Primary Effluent (mg/l)	47	70	92	44
Percent Removal	67.4	38.1	50.3	47.0
Final Effluent (mg/l)	4.5	4.8	7	6
Percent Removal	96.7	95.6	96.2	92.8

Performance for the primary clarifiers and the total plant during the month and on the maximum day were excellent. SOR for the primary clarifiers during the month was 1,256 gpd/ft^2 and the weir rate was 23,164 gpd/ft. These results suggest the character of the wastewater was quite

normal during this period and that the primary tanks are very effective under these conditions. At other times such as February and March 2000 the performance of the primary clarifiers was poor due to a plant upset believed to be caused by Sun Oil. This is clearly not due to a deficiency in the tank design, but due to a change in the character of wastewater, a result of the industrial wastewater that was received. During these periods the secondary system generally compensates for this change in character of the wastewater and the overall plant performance is not affected.

Trial loadings were conducted at the WRTP during which K-C bypassed their pretreatment system. The additional solids loading during these trials occurred from December 3 through December 17, 2001 and from August 30, 2002 through September 20, 2002. Average wastewater characteristics during the trials are presented in Table 7 along with average pre-trial observations for comparison.

Table 7: Primary Clarifier Performance During K-C Trials

Parameter (mg/l)	Observation During Trial		Average Pre-Trial	
	Dec. 2001	Sept. 2002	Dec. 2001	Sept. 2002
Influent TSS	238	216	151	150
Primary Effluent TSS	37	38	57	48
Influent BOD	121	109	111	78
Primary Effluent BOD	55	52	74	50

Although K-C discharged an additional 8 tons/day of solids during the first trial, TSS removal increased from 62% to 84% and BOD removal increased form 33% to 55%. During the second trial an additional 10 tons/day of solids were discharged by K-C and TSS removal increased from 68% to 82% while BOD removal increased form 36% to 52%. These increased removals resulted in the quality of the primary effluent being significantly improved overall in terms of both TSS and BOD in spite of the additional loading. The nature of these additional solids appears to cause TSS and BOD that normally do not settle to be absorbed and removed, resulting in a reduced loading to the secondary system. If this practice is adopted in the future, it is expected to be beneficial at 50 MGD, but probably to a lesser extent because the K-C loading will be a lower percentage of the total and the higher total flow will result in a somewhat lower removal efficiency across the primary clarifiers.

4.3 Summary

The primary clarifiers were conservatively designed for the initial rating of 40 MGD and subsequent increase to 44 MGD. The foregoing analysis also indicates the design is adequate for 50 MGD. The SOR at 50 MGD is within the guideline values and although the weir guideline is exceeded there is no evidence that this will adversely affect performance at 50 MGD.

5.0 DESIGN CRITERIA FOR AERATION TANKS

The design criteria for aeration tanks from the DEP guidelines are presented below with a comparison of the guideline value and the value at the re-rate capacity of 50 MGD.

Table 8: DEP Guidelines for Aeration Tanks

Parameter	Guideline Value	Value at 50 MGD	Comment
82.31 Minimum Aeration Retention Period	6 hours	4.8 hours	Discussed Below
82.31 Maximum Organic Loading (lb. BOD/1,000 ft^3/day)	40	32	**Guideline Achieved**
82.31 F/M Ratio (lb. BOD/lb. MLVSS/day)	0.2 to 0.5	0.31	**Guideline Achieved**
82.31 MLSS (mg/l)	1,000 - 3,000	2,000	**Guideline Achieved**
82.321 General Tank Configuration (2 items)	Provide	Provided	**Guideline Achieved**
82.322 Number of Units	Provide	Provided	**Guideline Achieved**
82.323 Inlets and Outlets (2 items)	Provide	Provided	**Guideline Achieved**
82.324 Freeboard (minimum)	3 feet	Provided	**Guideline Achieved**
82.325 Froth Spray	Consider	Not Required	**Guideline Achieved**
82.331 Minimum Oxygen Requirements (lb. O_2/lb. BOD)	1.1	1.1	**Guideline Achieved**
82.332 Diffused Air Systems (7 items)	Provide	Provided	**Guideline Achieved**

The activated sludge system consists of four (4) square tanks with aeration currently provided by mechanical surface aerators. A project is currently underway to replace and upgrade the aeration system with fine bubble diffusers to improve efficiency and provide capacity for the future loadings. These tanks can be operated in several flow patterns, but generally two trains of two tanks is used. Each tank has a volume of 2.5 MG for a total volume of 10.0 MG (rounded). At a design flow of 50 MGD this results in a retention time of 4.8 hours.

5.1 Activated Sludge Design Factors

The DEP Guidelines (82.31) present factors for three different approaches to evaluate the required capacity of aeration tankage: retention time, volumetric organic loading and food to microorganism (F/M) ratio. Historically, the design methodology has evolved as investigators have developed a better understanding of the process. Initial design methods were very

empirical with aeration basin retention time being one of the first parameters used. This was then advanced to use shorter periods for weaker wastewater and longer periods for stronger wastewaters. This led to the use of organic loading per unit volume and then the quantity of available biomass was brought into consideration using the F/M ratio. Finally, the concepts of microbial growth kinetics have been considered. A simplified application of growth kinetics utilizes the sludge age or mean cell residence time (MCRT) concept. The reciprocal of F/M gives a parameter that can be considered a BOD sludge age.

Secondary treatment is a direct result of the biomass being able to assimilate the organic matter entering the aeration tank. This can be considered a two-phase process. In the first phase a quantity of organic matter is absorbed by the biomass and in the second the mixture is stabilized. Although the absorption phase can occur rapidly it cannot be repeated, or additional organic matter absorbed, until the biomass has been stabilized. The contact stabilization process attempts to separate these phases.

The quantity of organic matter and the quantity of biomass are essential elements for a proper design. The retention time approach considers neither organic load nor biomass and the volumetric load considers only the organic load. The reason that retention time and volumetric loading approaches can be successful is because they are conservative and are most applicable to domestic wastewater. Their successful use requires a normal biomass concentration on the order of 2,000 mg/l.

The combination of wastewaters received at the WRPT is much weaker than typical domestic wastewater. At the 50 MGD design loading the TSS and BOD are projected to be 159 mg/l and 148 mg/l, respectively. This compares to 200 to 250 mg/l for both parameters in normal domestic wastewater. Therefore, adjusting the retention time based on BOD loading would give a minimum value of (148/150) x 6 =3.6 hours to (148/200) x 6 = 4.5 hours. This is less than the 4.8 hours provided at 50 MGD.

The projected BOD removal by the primary clarifiers at 50 MGD is 33%. This gives a projected BOD loading to the aeration system of 41,300 lbs./day, a volumetric loading rate of 32 lbs/day per 1,000 ft^3, and F/M ratio of 0.31 lb./day per lb MLVSS. The latter is based on a MLSS of 2,000 mg/l with 80% volatile. These parameters are well within the DEP guidelines.

5.2 Performance During High Loading

From October 6, 2000 to February 5, 2001 (4 months) aeration tank T-13 was off-line for tank cleaning and inspection. During that time three basins were in operation. Table 9 shows the Guideline values for the operational parameters of interest as compared to three and four basin operation and at the proposed 50 MGD operation.

For the year before Tank T-13 was taken out of service (October 1999 through September 2000) there were four basins in operation. December 2000 is shown separately in the table because there was a marked increase in influent BOD strength in that month as compared to October and November. The 50 MGD F/M ratio was calculated based upon a percent volatility of 80%. As noted in the table, the percent BOD reduction for three-basin operation was comparable to the

previous year running with four basins. Further, note that in December 2000 the organic loading was 35 lb. BOD per 1,000 ft^3/day for three basins which is greater than the loading projected for 50 MGD operation with four basins. Similarly, the F/M ratio during December with three basins was greater than for the projected 50 MGD operation (0.41 versus 0.31). The percent reduction in BOD (influent to effluent) reported in December 2000 was 94%, which is better than the current permit value of 89.2%. Although the retention time criterion was met in December, the performance at the higher, more significant organic loading parameters demonstrates the capacity of the system to handle the 50 MGD load.

During these periods of high loading permit compliance was maintained in all cases. As previously noted a project is underway to replace the existing mechanical surface aerators with submerged fine-bubble diffusers. This upgrade must be completed to provide adequate oxygen for the peak loading projected for the 50 MGD design capacity.

Table 9: Aeration Performance During 3-Basin Operation

Operation	Retention Period (Hours)	Maximum Organic Loading	F/M Ratio	MLSS (mg/l)	Percent BOD Reduction
PADEP Guideline	6	40	0.2-0.5	1,000-3,000	89.2
Four Basin Operation 32.34 MGD (Oct-99 thru Sep-00)	7.4	18.7	0.22	1,795	93.2
Three Basin Operation 27.27 MGD (OCT-00 thru Nov-00)	6.6	20.7	0.15	1,616	95
Three Basin Operation 29.18 MGD (Dec-00)	6.2	35	0.41	1,805	94
Future Operation (Four Basins) 50 MGD	4.8	31	0.31	2,000	89.2*

*Percent Reduction in BOD may be adjusted by PADEP based on CBOD allocation and increased flow. Assumed no change from current PADEP requirement.

5.3 Summary

The activated sludge system has performed very well to date. The projected future loading is well within two of the three design DEP guidelines. The third guideline, hydraulic retention time, is considered less applicable in this case because it does not account for the low strength of the mixed industrial and domestic wastewater. Therefore, the existing aeration tanks along with the new fine bubble aeration system are adequate to treat the projected future loading at 50 MGD.

6.0 DESIGN CRITERIA FOR SECONDARY CLARIFIERS

The design criteria for secondary clarifiers following conventional activated sludge treatment from the DEP guidelines are presented below with a comparison of the guideline value and the value at the re-rate capacity of 50 MGD.

Table 10: DEP Guidelines for Secondary Clarifiers

Parameter	Guideline Value	Value at 50 MGD	Comment
62.1 Dimensions (minimum lengths and depths)	Provide	Provided	**Guideline Achieved**
62.23 Surface Overflow Rate (SOR)			
At Max. Monthly Average Flow	800 gpd/ft^2	648 gpd/ft^2	**Guideline Achieved**
At Peak Hourly Flow	1,200 gpd/ft^2	1,361 gpd/ft^2	Discussed Below
62.23 Solids Loadings			
At Max. Monthly Average Flow	40 ppd/ft^2	21 ppd/ft^2	**Guideline Achieved**
At Peak Hourly Flow	50 ppd/ft^2	31 ppd/ft^2	**Guideline Achieved**
62.3 Inlet Structures to provide even flow distribution	Provide	Provided	**Guideline Achieved**
62.4 Drains to provide complete dewatering	Provide	Provided	**Guideline Achieved**
62.5 Bypasses for individual tanks	Provide	Provided	**Guideline Achieved**
62.6 Anti-flotation devices to prevent lifting of empty tanks	Provide	Provided	**Guideline Achieved**
62.7 Freeboard – minimum value	12 inches	Provided	**Guideline Achieved**
63 Weirs			
63.1 Weirs adjustable for leveling	Provide	Provided	**Guideline Achieved**
63.2 Locate to optimize hydraulic detention time	Provide	Provided	**Guideline Achieved**
63.3 Design Rate	15,000 gpd/ft	12,890 gpd/ft	**Guideline Achieved**
63.4 Weir troughs design requirements	Provide	Provided	**Guideline Achieved**
63.5 Submerged surfaces requirements	Provide	Provided	**Guideline Achieved**
64 Sludge and sum removal requirements (8 items)	Provide	Provided	**Guideline Achieved**
65 Protective and service facilities requirements (3 items)	Provide	Provided	**Guideline Achieved**

The WRTP has five secondary clarifiers. The four original units are 130 ft in diameter and the newer unit is 175 ft in diameter. Together they provide a total surface area of 77,146 ft^2. At a flow of 50 MGD the SOR is 648 gpd/ft^2 while at the projected maximum flow rate of 105 MGD the SOR is 1,361 gpd/ft$^{2.}$ The latter rate exceeds the DEP Guideline of 1,200 gpd/ft^2. The

Guideline also gives average and peak solids loadings of 40 and 50 lb/day/ft^{2,} respectively. At a MLSS level of 2,000 mg/l and the return sludge pumps operating at full capacity of 46 MGD the solids loading rates will be 21 and 33 lb/day/ft^2, respectively.

6.1 Clarifier Design Factors

The principal secondary clarifier loading factors used for design are hydraulic and solids surface loading rates. The SOR or hydraulic loading rate is the older factor that has been applied to both primary and secondary clarifier design. The solids loading concept is applicable to the activated sludge process in which the solids loading is high and thickening is important as well as clarification. Activated sludge undergoes zone settling wherein the floc particles maintain a fixed position relative to each other as they settle. Thickening occurs from the bottom of the sludge blanket and progresses upward in a batch test (Wastewater Engineering: Treatment/Disposal/Reuse, 2nd edition, Metcalf & Eddy, Inc., McGraw Hill Book Company, New York). In a flowing clarifier the sludge blanket increases in concentration from top to bottom. Above the sludge blanket is a zone of relatively clear effluent with stray pinflow settling as discrete particles. The clarification efficiency in this zone is related to SOR while the thickening efficiency in the sludge blanket is related to solids loading.

6.2 Performance During High Loading

Overall performance of the secondary clarifiers has been excellent in terms of final effluent TSS. Monthly averages have typically been less than 10 mg/l with an occasional result in the 12 to 14 mg/l range. The maximum monthly TSS average of 21.7 mg/l occurred during a period of process upset however this is still below the permit limit of 30 mg/l. An examination of the past one-year of monitoring data indicated that the maximum daily TSS and the peak flow day coincided only once with a TSS of 8 mg/l and peak flow rate of 64 MGD. The maximum TSS of 47 mg/l occurred on a day with a peak flow of 39 MGD. Looking at the peak-flow days of each month with rates of 40 to 72 MGD showed the corresponding TSS levels were 3 to 9 mg/l. These results suggest peak flows and maximum effluent TSS have no correlation. Instead, other process conditions lead to high TSS readings. Data from peak flow days in previous years include the following:

Table 11: Secondary Clarifier Performance During Peak Flow Days

Date	Daily Flow (MGD)	Peak Flow (MGD)	Max. SOR (gpd/ft^2)	Effluent TSS (mg/l)
August 26, 1999	53.8	96	1,503	7
September 16, 1999	71.9	99	1,550	133
September 21, 1999	58.0	83	1,299	8
March 21, 2000	51.0	83	1,076	28

Only the hurricane Floyd event on September 16, resulted in unsatisfactory TSS levels. This appears to have been due to a sustained high flow period lasting most of the day. During the first three of these events one of the smaller clarifiers was out of service resulting in the SOR exceeding the 1,200 gpd/ft^2 guideline.

This plant is not subject to the typical diurnal peaks of smaller domestic wastewater plants. Daily peaks are generally 40% greater than the average. Higher peaks are the result of rainfall and therefore occur less frequently. A peak that is twice the monthly average generally requires at least a 0.5 inch rainfall.

6.3 Summary

The secondary clarifiers have given excellent performance with monthly average effluent TSS levels generally below 10 mg/l. The average TSS has exceeded 15 mg/l only as a result of a process upset unrelated to peak flows except under an extreme condition. Extreme flows due to heavy rainfall have resulted in only one excursion above the permit limit when the SOR reached 1,550 gpd/ft^2 at 99 MGD. Satisfactory performance is expected at the future peak flow rate of 105 MGD at a SOR of 1,361 gpd/ft^2. The projected solids loading rates are well within the guideline values.

7.0 SUMMARY OF RERATE EVALUATION

The performance data for WRTP during the past five years has been summarized. These data show the plant has an excellent record of performance.

At the requested rerate capacity of 50 MGD certain PADEP Guideline criteria are exceeded, namely:

- Weir overflow rate in the primary clarifiers
- Retention time in the aeration tanks
- Surface overflow rate in the secondary clarifiers

Each of these criteria has been evaluated on a rational basis to show that other important design criteria are met and that adequate treatment performance will be achieved at the rerate flow and loadings. These conclusions are supported by past performance under peak loads due to facilities being out of service.

After consideration of all the supporting documentation presented herein, it is requested that the rated capacity of the WRTP be increased to 50 MGD.

Appendix B
Collection System Model

APPENDIX B

Collection System Modeling Approach

A computer model of the DELCORA collection system was developed using the commercially available computer software program, SewerCAD stand-alone version 5.5, developed by Haestad Methods, Inc. SewerCAD is specifically designed to analyze collection systems and was used to simulate hydraulic conditions in the DELCORA collection system. SewerCAD accommodates both gravity and pressure flow through pipe networks, pump stations, and force mains.

The DELCORA collection system is comprised of two subsystems that operate independently of one another and were, therefore, modeled and evaluated separately. The first system model, the southwest model, consists of the interceptors that convey flows to EPS-1 at the WRTP. The second system model, the northeast model, consists of the interceptors that convey flows to the Chester Pump Station (CPS), which pumps flows through Chester force main to the WRTP.

Development of the two system models involved creating input files based on data provided by DELCORA, and data from previously conducted studies. These input files were entered into SewerCAD to define the physical characteristics of the system. The following data sources were used as the base from which the model was built:

- GIS maps of DELCORA's collection system
- DELCORA system map drawings
- Historical engineering plans
- Interceptor system data collection surveys
- SWMM Model
- Central Delaware Pump Station Flow Diversion Study, Pump Station Modifications, KYPIPE 3 model input data

In addition to physical characteristics, flow data were input into the model. Flow data were obtained through flow metering efforts conducted by WESTON and their subcontractor, ADS Environmental Services. These efforts included the installation of 31

flow meters at various locations throughout the collection system. The flow meters measured flow through the interceptors continuously and data were recorded every 5 minutes from December 2004 through March 2005. Flow meters on the Delaware River interceptor were installed several months after the rest of the meters. Data were collected at these two meters from April to July 2005. Representative flow conditions were determined from these data and input into the system model at locations identified as connection points where adjacent sewer systems discharge into the DELCORA system.

The flow through each pipe segment was calculated in SewerCAD and compared to the total capacity of each pipe segment, which was calculated using the physical characteristics as input by the user. A pipe was considered at capacity when flowing full under gravity conditions.

For gravity flow, Manning's equation, as stated below was used to determine the capacity:

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

where:

Q = total flow in pipe (ft^3/second)

n = Manning's roughness coefficient (unitless)

A = cross sectional area of flow = cross sectional area of pipe for pipe flowing full (ft^2)

R = hydraulic radius= cross sectional area of pipe / wetted perimeter (ft)

S = slope of pipe (ft/ft)

To analyze gravity flow, conservation of energy principles were applied. An iterative process known as the standard step method was used to balance energy in the system. Calculations began at the most downstream locations in the system and continued upstream. The most downstream locations in the southwest and northeast models are the

outlet into the wet well at pump station EP-1 and the wet well at Chester pump station, respectively.

In addition to analyzing gravity flow, pressure flow was analyzed through the Chester force main using the Hazen-Williams equation, as stated below:

$$Q = 1.32CAR^{0.63}S^{0.54}$$

where:

Q = total flow in pipe (ft^3/second)

C = Hazen-Williams roughness coefficient (unitless)

A = cross sectional area of flow = cross sectional area of pipe for pipe flowing full (ft^2)

R = hydraulic radius= cross sectional area of pipe / wetted perimeter (ft)

S = slope of pipe (ft/ft)

To calculate gravity flow in a DELCORA interceptor, a flow profile was determined in terms of energy. The energy at any point in the system was expressed in terms of pressure head, velocity head, and elevation head, with the total head being the sum of these three components. The hydraulic gradeline is the sum of the pressure and elevation heads. The energy gradeline is the sum of the pressure, elevation, and velocity heads. In the case of gravity flow, the hydraulic and energy gradelines are equal and define the water surface in the pipe. Pipes were considered surcharged when the elevation of the hydraulic gradeline was above the crown of the pipe. Limitations in the system were identified from the results of this analysis.

The following equation describes the standard head loss method:

$$h_s = K\frac{V_0^2}{2g}$$

where:

h_s = structure head loss (ft)

K = head loss coefficient (unitless)

V_0 = exit pipe velocity (ft/second)

g = gravitational acceleration constant (ft/second^2)

All components of the equation were automatically calculated using SewerCAD except for the head loss coefficient, values for which typically range from 0.5 to 1. For this study, a value of 1.0 was used for all structures throughout the system.

System Infrastructure Input Data

Data input into the SewerCAD system model were considered in two categories: physical system characteristics and flow conditions. The physical characteristics describe the permanent infrastructure of the system (e.g., interceptors, pump stations, and force mains) and, therefore, define the capacity of the system to convey wastewater flows. Physical characteristics are discussed in this section and flow conditions that were input to simulate actual flows the DELCORA collection experiences are discussed in the following section.

In order to fully define the elements that comprise the collection system and the locations where flow is discharged to the system, several assumptions were made. Reasonable assumptions were made in some cases when the data sources that were reviewed did not provide enough information to sufficiently define all the elements. Any assumptions made regarding input data were deemed reasonable, which means that they do not significantly affect the results and conclusions of this system evaluation. Assumptions are described in the following subsections as they relate to specific input data.

The following subsections discuss the input data for the interceptors that comprise the DELCORA collection system as well as the Chester River siphon and the Chester pump station.

Interceptors

The interceptors that comprise the DELCORA collection system are constructed of a series of pipe segments which are connected primarily by manholes. Junction chambers were also used to represent locations where two pipe segments connect and no manhole exists. See tables C-1 through C-4 for summaries of the physical characteristics of the interceptors and manholes.

Data entered into SewerCAD were obtained from GIS system maps and supplemented, as needed, with data previously used to develop the DELCORA SWMM model and data from system plan drawings. To facilitate data entry, a spreadsheet, which included the required information, was created and imported directly into SewerCAD. The following characteristics describe the components of the interceptors:

- Pipe segments:
  - Length
  - Diameter
  - Material (SewerCAD defaults to a corresponding roughness coefficient)
  - Upstream and downstream invert elevations
- Manholes:
  - Sump elevation
  - Rim elevation
  - Structure diameter (assumed to equal 4 ft)
- Junction Chambers:
  - Bottom elevation (equals invert elevation)
  - Top elevation (equals crown elevation)
  - Structure diameter (approximately same diameter as connecting pipes)

As wastewater flow is conveyed through manholes or junction chambers, some of the energy in the fluid is lost. To account for this energy loss, the standard head loss method

($h_L = f*(V^2/2g)$) was applied at all structures within the system. Values for the head loss coefficient (f) range from 0.5 to 1.0. For this study, a value of f = 1.0 was used for all structures throughout the system.

Chester River Siphon

At the downstream end of Ridley Creek interceptor, just upstream of the Chester pump station, flow is conveyed through the Chester River siphon. Flow from the Ridley Creek interceptor enters the inlet chamber of this siphon. From the inlet chamber, flow is conveyed through three parallel pipes, two of which are 24 inches in diameter and one of which is 20 inches in diameter. At the downstream end of the siphon, there is an outlet chamber through which flow is conveyed before entering the CPS.

To model the Chester River siphon, one pipe, with an equivalent diameter, was divided into three segments connected by junction chambers. The junction chambers are located at the points where the siphon changes slope. Pipe segments were used to represent the inlet and outlet chambers. These pipe segments were defined as box culverts, which have dimensions as close to actual dimensions of the inlet and outlet chambers as possible.

The equivalent diameter was calculated using the following equation:

$$D_e = (D_1^{8/3} + D_2^{8/3} + D_3^{8/3})^{3/8}$$

where:

D_e = equivalent diameter of pipe (inches)

D_1 = diameter of first parallel pipe

D_2 = diameter of second parallel pipe

D_3 = diameter of third parallel pipe

Ridley Creek Siphon

Flow is conveyed across the Ridley Creek by the Ridley Creek siphon. Flow from the upstream section of the Ridley Creek interceptor enters the inlet chamber of this siphon.

From the inlet chamber, flow is conveyed through three parallel pipes, two of which are 16 inches in diameter and one of which is 12 inches in diameter. At the downstream end of the siphon, there is an outlet chamber through which the flow enters the downstream section of the Ridley Creek interceptor. The Ridley Creek siphon was modeled using the same method as the Chester Creek siphon.

Chester Pump Station (CPS) and Force Main

The Ridley Creek and 2nd Street interceptors contribute flow to the wet well at the CPS. Data that describe the physical and operational characteristics of the CPS and force main include the following:

- Wet well:
  - The type of cross section and cross sectional area
  - The operating range, which is defined by the following elevations:
    - Base elevation= bottom of the wet well
    - Minimum elevation= lowest water surface elevation in the wet well. Defined as the bottom of the operating range, which is the elevation of the water level in the wet well at which all pumps turn off.
    - Initial elevation= the elevation of the water in the wet well at which the model begins a simulation. Defined as the elevation at which the lead pump turns on according to current operating levels.
    - Maximum elevation= highest water surface elevation in the wet well. Defined as the ground elevation at the pump station.
- Pump Station
  - Number of pumps operating
  - Elevation of the pumps
  - Internal piping characteristics on the suction and discharge sides of pumps
  - Operating levels in the wet well that control the on/off status of each pump
  - Pump head capacity curve
- Force Main

- Total equivalent length (accounts for bends and fittings)
- Material
- Diameter
- Upstream and downstream invert elevations
- Connection locations for the Kimberly Clark PS (KCPS), Central Delaware PS (CDPS), and Sun Oil/Marcus Hook PS (SOPS/MHPS)

Most of the data input for the CPS and force main were obtained from DELCORA's existing KYPIPE 3 model. Exceptions include the wet well cross sectional area, the pump head capacity curve, and operating levels in the wet well that control the on/off status of each pump. The cross sectional area was calculated using dimensions given on plan drawing nos. 4002 and 4004 of DELCORA Contract No. CD-9911-C. System and pump curves were obtained from drawing no. 4009 of Contract No. CD-9911-C. The interpolated curve was calculated using the affinity laws applied to pump curves developed during pump tests, which were run with the pump operating at less than 100% speed. The curve input to the model for each pump represents current operating conditions for that pump running at 100% of its rated speed. Operating levels were specified on drawing E503 of Contract No. CD-9911-C.

The Chester force main discharges to the WRTP; the force main was characterized in the SewerCAD model of the force main system by three elevations: the ground elevation, the invert elevation at the downstream end of the force main, and the water surface elevation in the head structure that the pumps must overcome to convey flows to the WRTP. The force main has a total equivalent length of approximately 15,222 ft from the flow meter positioned at Chester pump station to the 60" force main at the WRTP. This information was obtained from *DELCORA Pump Station Modifications Report, Volume I of II.*

The Chester pump station conveys flows through the Chester force main. The total equivalent length of this force main, which accounts for bends and fittings, was determined from the *DELCORA Pump Station Modifications Report, Volume I of II.*

Internal piping conveys wastewater through a pump station, from the wet well, to the pumps, and finally, to the discharge force main. In SewerCAD, internal piping is represented as a series of force mains connected by pressure junctions, which serve the purpose of connecting force mains of different diameters or physical properties. To define internal piping characteristics, the diameter, length, and material were determined for each pipe. Also, minor losses were considered by identifying components that cause a loss of energy in the flow and then calculating the equivalent length of each pipe segment based on the loss components. The equivalent length for the pipe segments comprising the suction and discharge piping were determined in the *DELCORA Pump Station Modifications Report, Volume I of II.* This pre-determined information was input directly into SewerCAD.

Flow Data

Flow data for the CPS, and contributing flows from pump stations connecting to the Chester force main, were obtained from pump station flow meter records, or assumed using allowable flows. Flow data for the gravity interceptors were collected by a series of 31 temporary metering stations that were installed, monitored, and removed by WESTON and their subcontractor, ADS Environmental Services. Flow meters were placed at strategic locations throughout the interceptor system, with at least one flow meter on every interceptor except for the Dock Street Extension. Although three flow meters were planned for the Delaware River interceptor, surcharging along this interceptor prohibited one meter from being installed.

Flows were measured continuously at all the metering stations and measurements were recorded every 5 minutes. ADS collected the data recorded by each flow meter for approximately 3 months. The final data submittal provided by ADS was used to calculate a dry weather average flow value as input for the model.

To calculate the dry weather average flow for each meter, a period of dry weather was identified during the meter data collection time frame. There were only two data points of trace rainfall during the time from 17 January 2005 to 13 February 2005. Therefore the 5-minute flow data recorded during those 27 days was averaged for the entire time period

to obtain a value for the dry weather average flow. The flow meters on the Delaware River interceptor were installed several months after the rest of the meters. Therefore, the dry weather time periods for meters 02 and 03 are 11 to 26 June 2005 and 2 to 19 May 2005, respectively.

Flows were input into the hydraulic model of the DELCORA system at the manhole locations where they tie into the interceptors. These manholes were determined using flow input locations identified on GIS system maps and in the SWMM model. The flow measured by a particular meter was input upstream of the flow meter. If more than one connection point to the interceptor exists between two flow meter locations, the measured flow was proportioned based on the estimated dry weather flows of the drainage basins contributing flow to each connection point, as defined in Table 2 of the Report of CSO Modeling for 2004 (WESTON, 2005). The drainage area to each regulator and/or sewer lateral was delineated by WESTON based upon sewer maps and inlet maps. If there is more than one flow meter along an interceptor, the incremental flow added to the section of interceptor between two flow meters was considered.

For example, if two input locations were identified upstream of a flow meter, then the total flow measured would be proportioned in two ways. Figure 1 contains a schematic explanation of the area-weighted flow proportioning method. Drainage basins A and B contribute flow that is measured at the flow meter. Therefore the total area equals the sum of areas A and B. Basin A, which is 1/3 of the total area, contributes flow to input location #1 and basin B, which is 2/3 of the total area, contributes flow to input location #2. The total flow is proportioned according to the fraction of the total area contributing to each input location. Thus, 1/3 of the total flow is input at location #1 and 2/3 of the total flow is input at location #2.

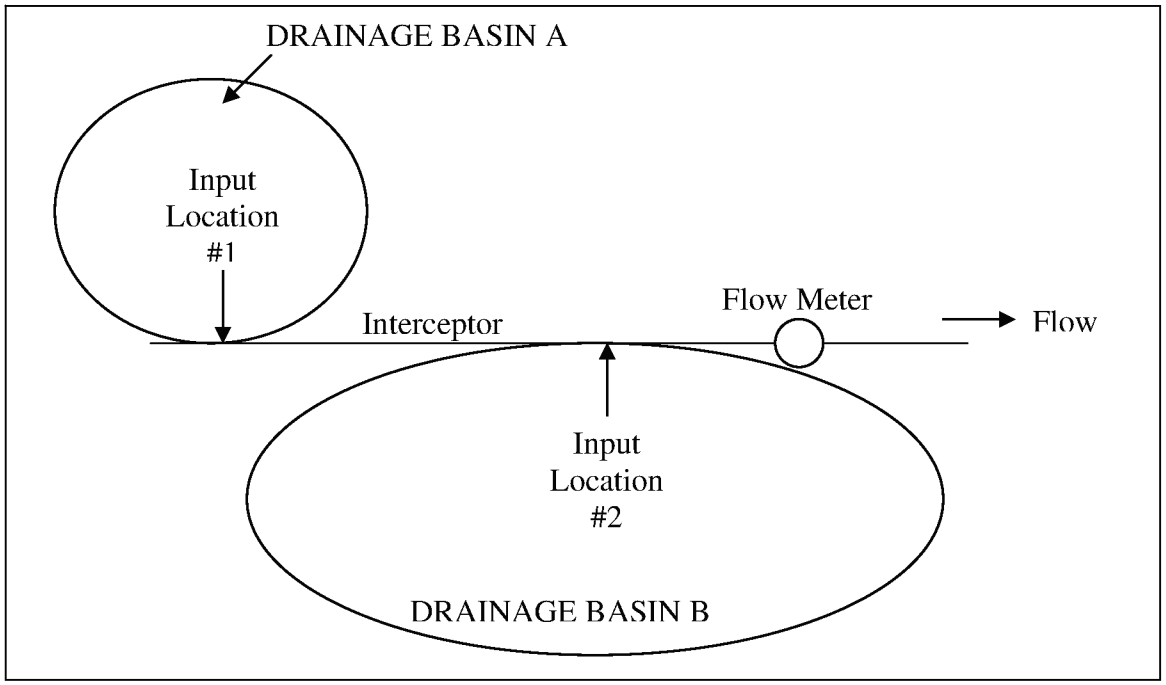

FIGURE 1: Example to explain determination of flows input at each connection point

In addition to flow connections with the interceptors, there are three direct connections to the Chester force main from the following pump stations: KCPS, CDPS, and SOPS/MHPS. Just downstream of the CPS, flows from the KCPS tie into the Chester force main. Further downstream, flows from CDPS tie into the force main. The third tie in contributes flows to the force main from SOPS and MHPS.

Appendix C
Sewer CAD Results

Table C-1
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Manhole Information - Northeast Model

Manhole ID	Description	Bolted Cover?	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Average Flow (mgd)	Maximum Flow (mgd)	Future Average Flow (mgd)	Future Maximum Flow (mgd)
04-001	2nd Street interceptor	FALSE	10.95	10.95	-4.81	4.141	7.485	4.159	7.56
04-002	2nd Street interceptor	FALSE	6.69	6.69	-4.71	4.141	7.485	4.159	7.56
04-002-001	Dock Street Ext interceptor	FALSE	8.67	8.67	1	0	0	0	0
04-002-002	Dock Street Ext interceptor	FALSE	8.92	8.92	1.08	0	0	0	0
04-003	2nd Street interceptor	FALSE	9.85	9.85	-3.85	4.141	7.485	4.159	7.56
04-004	2nd Street interceptor (MS #11)	FALSE	16.72	16.72	-2.88	1.57	3.435	1.572	3.461
04-005	2nd Street interceptor	FALSE	22.56	22.56	-2.14	1.57	3.435	1.572	3.461
04-006	2nd Street interceptor	FALSE	23.1	23.1	-1.85	1.57	3.435	1.572	3.461
04-007	2nd Street interceptor	FALSE	20.16	20.16	-1.61	1.57	3.435	1.572	3.461
04-008	2nd Street interceptor	FALSE	20.03	20.03	-1.57	1.386	3.1	1.388	3.106
04-009	2nd Street interceptor	FALSE	19.87	19.87	-1.38	1.315	2.97	1.317	2.976
04-010	2nd Street interceptor	FALSE	21.08	21.08	-0.92	1.315	2.97	1.317	2.976
04-011	2nd Street interceptor	FALSE	20.5	20.5	-0.33	1.315	2.97	1.317	2.976
04-012	2nd Street interceptor	FALSE	16.37	16.37	0.44	1.315	2.97	1.317	2.976
04-013	2nd Street interceptor (MS #12)	FALSE	14.82	14.82	0.93	1.315	2.97	1.315	2.97
04-014	2nd Street interceptor	FALSE	14.21	14.21	1.39	1.315	2.97	1.315	2.97
04-015	2nd Street interceptor	FALSE	18.86	18.86	0.94	0.924	2.247	0.924	2.247
04-016	2nd Street interceptor	FALSE	21.07	21.07	0.57	0.924	2.247	0.924	2.247
04-017	2nd Street interceptor	FALSE	20.92	20.92	0.52	0.924	2.247	0.924	2.247
04-018	2nd Street interceptor	FALSE	18.89	18.89	0.69	0.924	2.247	0.924	2.247
04-020	2nd Street interceptor (MS #13)	FALSE	16.18	16.18	1.08	0.663	1.765	0.663	1.765
04-021	2nd Street interceptor	FALSE	13.86	13.86	2.26	0.663	1.765	0.663	1.765
04-022	2nd Street interceptor	FALSE	13.96	13.96	2.06	0.663	1.765	0.663	1.765
05-001	Penn St interceptor	FALSE	10.39	10.39	-2.91	2.571	4.05	2.587	4.099
05-002	Penn St interceptor	FALSE	11.63	11.63	-2.42	2.571	4.05	2.587	4.099
05-003	Penn St interceptor (MS #14)	FALSE	13.7	13.7	-2.3	2.571	4.05	2.587	4.099
05-004	Penn St interceptor	FALSE	12.59	12.59	-2.11	2.571	4.05	2.587	4.099
05-005	Penn St interceptor	FALSE	12.35	12.35	-2.15	2.571	4.05	2.587	4.099
05-006	Penn St interceptor	FALSE	10.47	10.47	-0.73	2.571	4.05	2.587	4.099
05-007	Penn St interceptor (MS #15)	FALSE	19.27	19.27	-0.33	2.289	3.624	2.305	3.673
05-008	Penn St interceptor	FALSE	19.93	19.93	-0.22	2.289	3.624	2.305	3.673
05-009	Penn St interceptor	FALSE	20	20	-0.09	2.289	3.624	2.305	3.673
05-009A	Penn St interceptor	FALSE	20	20	-0.01	2.289	3.624	2.305	3.673
05-010	Penn St interceptor	FALSE	11.18	11.18	0.16	2.285	3.618	2.301	3.666

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SewerCAD Model Manhole Information - Northeast Model

Manhole ID	Description	Bolted Cover?	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Average Flow (mgd)	Maximum Flow (mgd)	Future Average Flow (mgd)	Future Maximum Flow (mgd)
05-011	Penn St interceptor	FALSE	18.67	18.67	0.27	2.251	3.56	2.268	3.609
05-012	Penn St interceptor	FALSE	19.68	19.68	0.39	2.251	3.56	2.268	3.609
05-013	Penn St interceptor	FALSE	22.19	22.19	0.84	2.251	3.56	2.268	3.609
05-014	Penn St interceptor	FALSE	16.42	16.42	0.82	2.247	3.553	2.263	3.602
05-015	Penn St interceptor	FALSE	17.27	17.27	0.87	2.247	3.553	2.263	3.602
05-015A	Penn St interceptor	FALSE	16.96	16.96	0.89	2.247	3.553	2.263	3.602
05-016	Penn St interceptor	FALSE	16.21	16.21	0.93	2.247	3.553	2.263	3.602
05-017	Penn St interceptor (MS #16)	FALSE	15.8	15.8	0.98	2.247	3.553	2.263	3.602
05-018	Penn St interceptor	FALSE	15.39	15.39	1.04	2.159	3.425	2.175	3.474
05-019	Penn St interceptor	FALSE	15.14	15.14	1.07	2.159	3.425	2.175	3.474
05-020	Penn St interceptor	FALSE	14.78	14.78	1.12	2.159	3.425	2.175	3.474
05-020-001	Chester Crk E interceptor (MS #17)	FALSE	12.56	12.56	1.15	1.485	2.271	1.491	2.29
05-020-002	Chester Crk E interceptor	FALSE	9.79	9.79	1.08	1.485	2.271	1.491	2.29
05-020-003	Chester Crk E interceptor	FALSE	15.35	15.35	1.05	1.485	2.271	1.491	2.29
05-020-004	Chester Crk E interceptor	FALSE	19.75	19.75	5.5	1.485	2.271	1.491	2.29
05-020-005	Chester Crk E interceptor	FALSE	15.12	15.12	9.62	1.485	2.271	1.491	2.29
05-020-006	Chester Crk E interceptor	FALSE	20.89	20.89	9.99	1.485	2.271	1.491	2.29
05-020-007	Chester Crk E interceptor	FALSE	27.55	27.55	11.75	1.485	2.271	1.491	2.29
05-020-008	Chester Crk E interceptor	FALSE	27.68	27.68	12.12	1.455	2.226	1.461	2.245
05-020-009	Chester Crk E interceptor	FALSE	24.66	24.66	13.91	1.455	2.226	1.461	2.245
05-020-010	Chester Crk E interceptor	FALSE	29.1	29.1	15	1.455	2.226	1.461	2.245
05-020A	Chester Crk W interceptor	FALSE	14.61	14.61	1.21	2.159	3.425	2.175	3.474
05-021	Chester Crk W interceptor	FALSE	14.3	14.3	1.3	0.674	1.154	0.684	1.184
05-022	Chester Crk W interceptor	FALSE	15.06	15.06	2	0.674	1.154	0.684	1.184
05-023	Chester Crk W interceptor	FALSE	18.18	18.18	2.17	0.674	1.154	0.684	1.184
05-024	Chester Crk W interceptor (MS #18)	FALSE	14.33	14.33	2.93	0.674	1.154	0.684	1.184
05-025	Chester Crk W interceptor	FALSE	16.24	16.24	3.03	0.674	1.154	0.684	1.184
05-026	Chester Crk W interceptor	FALSE	23.31	23.31	3.07	0.674	1.154	0.684	1.184
05-027	Chester Crk W interceptor	FALSE	16.55	16.55	3.15	0.654	1.123	0.664	1.154
05-028	Chester Crk W interceptor	FALSE	14.38	14.38	3.18	0.654	1.123	0.664	1.154
05-029	Chester Crk W interceptor	FALSE	15.86	15.86	3.26	0.654	1.123	0.664	1.154
05-030	Chester Crk W interceptor (MS #19)	FALSE	14.51	14.51	3.66	0.594	1.031	0.604	1.061
05-031	Chester Crk W interceptor	FALSE	16.06	16.06	7.39	0.594	1.031	0.604	1.061
05-032	Chester Crk W interceptor	FALSE	17.97	17.97	7.57	0.594	1.031	0.594	1.031

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SewerCAD Model Manhole Information - Northeast Model

Manhole ID	Description	Bolted Cover?	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Average Flow (mgd)	Maximum Flow (mgd)	Future Average Flow (mgd)	Future Maximum Flow (mgd)
05-033	Chester Crk W interceptor	FALSE	18.95	18.95	7.66	0.594	1.031	0.594	1.031
05-034	Chester Crk W interceptor	FALSE	19.27	19.27	7.7	0.594	1.031	0.594	1.031
05-034-001	Chester Crk W interceptor	FALSE	16.83	16.83	7.73	0.548	0.959	0.548	0.959
05-034-002	Chester Crk W interceptor	FALSE	27.99	27.99	8.99	0.548	0.959	0.548	0.959
06-001	Edgemont Ave interceptor	FALSE	8.19	8.19	-1.06	0.144	0.483	0.144	0.483
06-002	Edgemont Ave interceptor	FALSE	10.4	10.4	-0.7	0.144	0.483	0.144	0.483
06-002A	Edgemont Ave interceptor (MS #20)	FALSE	11.54	11.54	-0.31	0.144	0.483	0.144	0.483
06-003	Edgemont Ave interceptor	FALSE	12.68	12.68	0.08	0.144	0.483	0.144	0.483
06-004	Edgemont Ave interceptor	FALSE	14.06	14.06	0.96	0.126	0.434	0.126	0.434
06-005	Edgemont Ave interceptor	FALSE	17.06	17.06	1.31	0.126	0.434	0.126	0.434
06-006	Edgemont Ave interceptor	FALSE	24.65	24.65	1.9	0.126	0.434	0.126	0.434
06-007	Edgemont Ave interceptor	FALSE	24.3	24.3	2.6	0.126	0.434	0.126	0.434
06-008	Edgemont Ave interceptor	FALSE	21.8	21.8	2.65	0.126	0.434	0.126	0.434
06-009	Edgemont Ave interceptor	FALSE	22.1	22.1	2.59	0.105	0.374	0.105	0.374
06-010	Edgemont Ave interceptor	FALSE	23.75	23.75	2.25	0.105	0.374	0.105	0.374
06-011	Edgemont Ave interceptor	FALSE	23.19	23.19	3.2	0.105	0.374	0.105	0.374
06-012	Edgemont Ave interceptor	FALSE	23.21	23.21	3.21	0.105	0.374	0.105	0.374
06-013	Edgemont Ave interceptor	FALSE	21.37	21.37	3.81	0.1	0.36	0.1	0.36
06-014	Edgemont Ave interceptor (MS #21)	FALSE	16.28	16.28	3.95	0.1	0.36	0.1	0.36
06-015	Edgemont Ave interceptor	FALSE	17.03	17.03	3.98	0.1	0.36	0.1	0.36
07-001	Ridley Crk interceptor	FALSE	7.13	7.13	-8.82	4.017	6.563	4.415	7.766
07-002	Ridley Crk interceptor	FALSE	8.33	8.33	-7.42	4.017	6.563	4.415	7.766
07-003	Ridley Crk interceptor	FALSE	8.35	8.35	-8.45	4.017	6.563	4.415	7.766
07-004	Ridley Crk interceptor (MS #22)	FALSE	10.01	10.01	-7.99	3.873	6.081	4.271	7.284
07-005	Ridley Crk interceptor	FALSE	9.99	9.99	-7.86	3.873	6.081	4.271	7.284
07-006	Ridley Crk interceptor	FALSE	7.89	7.89	-7.16	3.848	6.04	4.246	7.243
07-007	Ridley Crk interceptor	FALSE	8.66	8.66	-7.19	3.848	6.04	4.246	7.243
07-008	Ridley Crk interceptor	FALSE	9.22	9.22	-6.98	3.661	5.743	4.059	6.946
07-009	Ridley Crk interceptor	FALSE	9.46	9.46	-6.84	3.661	5.743	4.059	6.946
07-010	Ridley Crk interceptor	FALSE	9.86	9.86	-6.04	3.661	5.743	4.059	6.946
07-011	Ridley Crk interceptor	FALSE	8.74	8.74	-5.6	3.661	5.743	4.059	6.946
07-012	Ridley Crk interceptor (MS #24)	FALSE	10.69	10.69	-5.31	3.661	5.743	4.059	6.946
07-013	Ridley Crk interceptor	FALSE	9.13	9.13	-5.47	3.661	5.743	4.059	6.946
07-014	Ridley Crk interceptor	FALSE	15.81	15.81	-5.24	3.661	5.743	4.059	6.946

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SewerCAD Model Manhole Information - Northeast Model

Manhole ID	Description	Bolted Cover?	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Average Flow (mgd)	Maximum Flow (mgd)	Future Average Flow (mgd)	Future Maximum Flow (mgd)
07-015	Ridley Crk interceptor (MS #23)	FALSE	17.05	17.05	-4.95	3.661	5.743	4.059	6.946
07-016	Ridley Crk interceptor	FALSE	16.07	16.07	-4.73	3.661	5.743	4.059	6.946
07-017	Ridley Crk interceptor	FALSE	14.37	14.37	-4.43	3.661	5.743	4.059	6.946
07-018	Ridley Crk interceptor	FALSE	17.64	17.64	-4.31	3.324	5.214	3.722	6.417
07-019	Ridley Crk interceptor	FALSE	12.5	12.5	-3.9	3.324	5.214	3.722	6.417
07-020	Ridley Crk interceptor (MS #25)	FALSE	12.06	12.06	-3.64	3.324	5.214	3.722	6.417
07-021	Ridley Crk interceptor	FALSE	9.06	9.06	-3.04	3.324	5.214	3.722	6.417
07-022	Ridley Crk interceptor	FALSE	8.39	8.39	-3.46	3.324	5.214	3.722	6.417
07-023	Ridley Crk interceptor	FALSE	7.13	7.13	-3.32	3.055	4.824	3.453	6.027
07-024	Ridley Crk interceptor	FALSE	7.07	7.07	-3.13	3.044	4.808	3.442	6.011
07-025	Ridley Crk interceptor	FALSE	9.92	9.92	-2.66	3.044	4.808	3.442	6.011
07-026	Ridley Crk interceptor	FALSE	11.83	11.83	-1.92	3.044	4.808	3.442	6.011
07-027	Ridley Crk interceptor	FALSE	11.6	11.6	-1.9	3.044	4.808	3.442	6.011
07-028	Ridley Crk interceptor	FALSE	12.09	12.09	-0.71	2.775	4.418	3.173	5.621
07-029	Ridley Crk interceptor (MS #26)	FALSE	10.44	10.44	-0.36	2.775	4.418	3.173	5.621
07-030	Ridley Crk interceptor	FALSE	13.94	13.94	0.04	2.775	4.418	3.173	5.621
07-031	Ridley Crk interceptor	FALSE	8.84	8.84	0.21	2.775	4.418	3.173	5.621
07-032	Ridley Crk interceptor	FALSE	9.01	9.01	0.16	2.775	4.418	3.173	5.621
07-033	Ridley Crk interceptor	FALSE	9.18	9.18	0.58	2.775	4.418	3.173	5.621
07-034	Ridley Crk interceptor	FALSE	8.87	8.87	0.86	2.775	4.418	3.173	5.621
07-035	Ridley Crk interceptor	FALSE	8.51	8.51	0.86	2.775	4.418	3.173	5.621
07-036	Ridley Crk interceptor (MS #27)	FALSE	7.47	7.47	1.25	2.366	3.846	2.764	5.049
07-037	Ridley Crk interceptor	FALSE	13.6	13.6	1.4	2.366	3.846	2.764	5.049
07-038	Ridley Crk interceptor	FALSE	14.27	14.27	1.92	2.366	3.846	2.764	5.049
07-039	Ridley Crk interceptor	FALSE	12.84	12.84	2.09	2.315	3.771	2.713	4.974
07-040	Ridley Crk interceptor	FALSE	13.75	13.75	1.65	2.315	3.771	2.713	4.974
07-041	Ridley Crk interceptor	FALSE	12.27	12.27	1.97	2.284	3.726	2.682	4.929
07-042	Ridley Crk interceptor	FALSE	14.64	14.64	1.99	2.284	3.726	2.682	4.929
07-043	Ridley Crk interceptor	FALSE	16.16	16.16	2.46	2.284	3.726	2.682	4.929
07-044	Ridley Crk interceptor (MS #28)	FALSE	19.36	19.36	2.83	2.284	3.726	2.682	4.929
07-045	Ridley Crk interceptor	FALSE	29.25	29.25	2.75	2.263	3.696	2.263	3.696
07-046	Ridley Crk interceptor	FALSE	17.41	17.41	3.05	2.263	3.696	2.263	3.696
07-047	Ridley Crk interceptor	FALSE	9.84	9.84	3.24	2.263	3.696	2.263	3.696
07-048	Ridley Crk interceptor	FALSE	12.14	12.14	3.38	2.068	3.356	2.068	3.356

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SewerCAD Model Manhole Information - Northeast Model

Manhole ID	Description	Bolted Cover?	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Average Flow (mgd)	Maximum Flow (mgd)	Future Average Flow (mgd)	Future Maximum Flow (mgd)
07-050a	Ridley Crk interceptor (MS #29)	FALSE	15.61	15.61	3.66	2.068	3.356	2.068	3.356
07-051a	Ridley Crk interceptor	FALSE	16.29	16.29	3.91	2.068	3.356	2.068	3.356
07-052	Ridley Crk interceptor	FALSE	14.1	14.1	4.07	2.068	3.356	2.068	3.356
07-053	Ridley Crk interceptor	FALSE	12.06	12.06	4.07	2.068	3.356	2.068	3.356
07-054	Ridley Crk interceptor	FALSE	12.06	12.06	4.33	2.068	3.356	2.068	3.356
07-055	Ridley Crk interceptor	FALSE	15.75	15.75	4.4	2.068	3.356	2.068	3.356
07-056	Ridley Crk interceptor	FALSE	31.35	31.35	4.95	2.068	3.356	2.068	3.356
07-057	Ridley Crk interceptor	FALSE	28.68	28.68	4.9	2.068	3.356	2.068	3.356
07-058	Ridley Crk interceptor	FALSE	10.61	10.61	4.86	2.068	3.356	2.068	3.356
07-059	Ridley Crk interceptor	FALSE	13.44	13.44	4.84	1.808	2.903	1.808	2.903
07-059A	Ridley Crk interceptor	FALSE	15.86	15.86	7.08	1.808	2.903	1.808	2.903
07-060	Ridley Crk interceptor	FALSE	16.94	16.94	8.08	1.576	2.498	1.576	2.498
07-062	Ridley Crk Siphon	FALSE	18.28	18.28	9.33	1.576	2.498	1.576	2.498
07-063	Ridley Crk Siphon	FALSE	18.79	18.79	9.8	1.576	2.498	1.576	2.498
07-064	Ridley Crk interceptor	FALSE	19.46	19.46	10.42	1.576	2.498	1.576	2.498
07-066	Ridley Crk Interceptor	FALSE	22.34	22.34	15.29	1.576	2.498	1.576	2.498
07-068	Ridley Crk Interceptor	TRUE	22.7	22.7	15.3	1.576	2.498	1.576	2.498
07-069	Ridley Crk Interceptor	FALSE	23	23	15.32	1.576	2.498	1.576	2.498
07-070	Ridley Crk Interceptor	FALSE	23	23	15.36	1.576	2.498	1.576	2.498
07-071	Ridley Crk Interceptor	FALSE	23	23	15.4	1.576	2.498	1.576	2.498
07-072	Ridley Crk Interceptor	FALSE	23	23	15.44	1.334	2.077	1.334	2.077
07-073	Ridley Crk Interceptor	FALSE	23	23	15.48	1.334	2.077	1.334	2.077
07-074	Ridley Crk Interceptor	FALSE	23	23	15.54	1.334	2.077	1.334	2.077
07-075	Ridley Crk Interceptor	FALSE	23	23	15.58	1.334	2.077	1.334	2.077
07-076	Ridley Crk Interceptor	FALSE	23	23	15.62	1.334	2.077	1.334	2.077
07-077	Ridley Crk Interceptor	FALSE	23	23	15.69	1.334	2.077	1.334	2.077
07-078	Ridley Crk Interceptor	FALSE	23	23	15.73	1.334	2.077	1.334	2.077
07-079	Ridley Crk Interceptor	FALSE	23	23	15.77	1.334	2.077	1.334	2.077
07-080	Ridley Crk Interceptor	FALSE	23	23	15.79	1.334	2.077	1.334	2.077
07-081	Ridley Crk Interceptor	FALSE	23	23	15.81	1.334	2.077	1.334	2.077
07-082	Ridley Crk Interceptor	FALSE	23	23	15.84	1.334	2.077	1.334	2.077
07-083	Ridley Crk Interceptor	FALSE	24.25	24.25	15.88	1.334	2.077	1.334	2.077
07-084	Ridley Crk Interceptor	FALSE	24.01	24.01	17.41	1.334	2.077	1.334	2.077
07-085	Ridley Crk Interceptor	FALSE	26.71	26.71	20.36	0.866	1.343	0.866	1.343

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SewerCAD Model Manhole Information - Northeast Model

Manhole ID	Description	Bolted Cover?	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Average Flow (mgd)	Maximum Flow (mgd)	Future Average Flow (mgd)	Future Maximum Flow (mgd)
07-086	Ridley Crk Interceptor	FALSE	31.83	31.83	21.73	0.866	1.343	0.866	1.343
07-087	Ridley Crk Interceptor	FALSE	30.52	30.52	22.92	0.866	1.343	0.866	1.343
07-088	Ridley Crk Interceptor	FALSE	32.1	32.1	24.3	0.866	1.343	0.866	1.343
07-089	Ridley Crk Interceptor	FALSE	32.5	32.5	24.74	0.866	1.343	0.866	1.343
07-090	Ridley Crk Interceptor	FALSE	32.78	32.78	25.18	0.866	1.343	0.866	1.343
07-091	Ridley Crk Interceptor	FALSE	32.78	32.78	26.01	0.866	1.343	0.866	1.343
07-092	Ridley Crk Interceptor	FALSE	33.07	33.07	26.84	0.866	1.343	0.866	1.343
NSYPHON	Chester River Siphon	FALSE	7.13	7.13	-9.17	4.017	6.563	4.415	7.766

Table C-2
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SewerCAD Model Manhole Information - Southwest Model

Manhole ID	Description	Bolted Cover?	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Average Flow (mgd)	Maximum Flow (mgd)	Future Average Flow (mgd)	Future Maximum Flow (mgd)
01-001	Del River interceptor	FALSE	12	12	-6.79	2.288	4.662	2.623	6.206
01-002	Del River interceptor	FALSE	12.85	12.85	-5.38	2.288	4.662	2.623	6.206
01-003	Del River interceptor	FALSE	12.85	12.85	-5.07	2.288	4.662	2.623	6.206
01-004	Del River interceptor	FALSE	14.87	14.87	-4.07	2.288	4.662	2.623	6.206
01-005	Del River interceptor	FALSE	13.81	13.81	-3.99	1.056	2.828	1.056	2.828
01-006	Del River interceptor	FALSE	14	14	-3.7	1.056	2.828	1.056	2.828
01-007	Del River interceptor	FALSE	16.11	16.11	-3.4	1.056	2.828	1.056	2.828
01-008	Del River interceptor	FALSE	17.84	17.84	-3.52	1.056	2.828	1.056	2.828
01-009	Del River interceptor	FALSE	18.99	18.99	-3.53	1.056	2.828	1.056	2.828
01-010	Del River interceptor	FALSE	18.2	18.2	-2.65	1.056	2.828	1.056	2.828
01-011	Del River interceptor	FALSE	19.13	19.13	-2.11	0.897	2.398	0.897	2.398
01-012	Del River interceptor	FALSE	17.66	17.66	-2.19	0.835	2.231	0.835	2.231
01-013	Del River interceptor	FALSE	15.26	15.26	-1.64	0.835	2.231	0.835	2.231
01-014	Del River interceptor	FALSE	15.73	15.73	-1.37	0.835	2.231	0.835	2.231
01-015	Del River interceptor	FALSE	15.34	15.34	-1.36	0.835	2.231	0.835	2.231
01-016	Del River interceptor	FALSE	16.27	16.27	-1.23	0.835	2.231	0.835	2.231
01-017	Del River interceptor	FALSE	15.03	15.03	-1.14	0.835	2.231	0.835	2.231
01-018	Del River interceptor	FALSE	12.26	12.26	-0.64	0.155	0.423	0.155	0.423
01-019	Del River interceptor	FALSE	13.93	13.93	-0.17	0.155	0.423	0.155	0.423
01-020	Del River interceptor	FALSE	14.44	14.44	-0.06	0.155	0.423	0.155	0.423
01-021	Del River interceptor	FALSE	15.35	15.35	0.35	0.155	0.423	0.155	0.423
01-022	Del River interceptor	FALSE	13.81	13.81	1.01	0.104	0.287	0.104	0.287
01-023	Del River interceptor	FALSE	11.75	11.75	1.4	0.104	0.287	0.104	0.287
01-024	Del River interceptor	FALSE	11.32	11.32	1.62	0.104	0.287	0.104	0.287
02-001	West End interceptor	FALSE	14.84	14.84	7.34	1.232	1.834	1.567	3.378
02-002	West End interceptor (MS #4)	FALSE	18.87	18.87	7.52	1.232	1.834	1.567	3.378
02-003	West End interceptor	FALSE	18.7	18.7	7.97	1.232	1.834	1.567	3.378
02-004	West End interceptor	FALSE	24.92	24.92	7.97	1.046	1.508	1.381	3.052
02-005	West End interceptor	FALSE	19.99	19.99	8.24	1.046	1.508	1.381	3.052
02-006	West End interceptor	FALSE	23.96	23.96	8.61	1.046	1.508	1.381	3.052
02-007	West End interceptor	FALSE	22.16	22.16	8.71	1.046	1.508	1.381	3.052
02-007-001	Booth Street interceptor (MS #8)	FALSE	24.3	24.3	13.4	0.581	0.775	0.916	2.319
02-007-002	Booth Street interceptor	FALSE	26.31	26.31	16.36	0.581	0.775	0.916	2.319
02-007-003	Booth Street interceptor	FALSE	27.72	27.72	18.82	0.581	0.775	0.916	2.319

Table C-2
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SewerCAD Model Manhole Information - Southwest Model

Manhole ID	Description	Bolted Cover?	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Average Flow (mgd)	Maximum Flow (mgd)	Future Average Flow (mgd)	Future Maximum Flow (mgd)
02-007-004	Booth Street interceptor	FALSE	34.09	34.09	29.77	0.581	0.775	0.916	2.319
02-007-005	Booth Street interceptor	FALSE	37.4	37.4	29.5	0.581	0.775	0.916	2.319
02-007-006	Booth Street interceptor	FALSE	43.08	43.08	35.88	0.581	0.775	0.916	2.319
02-007-007	Booth Street interceptor	FALSE	47.9	47.9	38.9	0.581	0.775	0.916	2.319
02-007-008	Booth Street interceptor	FALSE	53.07	53.07	42.34	0.581	0.775	0.916	2.319
02-007-009	Booth Street interceptor	FALSE	55.02	55.02	44.97	0.581	0.775	0.916	2.319
02-007-010	Booth Street interceptor	FALSE	58.73	58.73	49.13	0.581	0.775	0.916	2.319
02-007-011	Booth Street interceptor	FALSE	59.36	59.36	49.41	0.581	0.775	0.916	2.319
02-007-012	Booth Street interceptor	FALSE	65.4	65.4	53.9	0.581	0.775	0.916	2.319
02-007-013	Booth Street interceptor	FALSE	66.16	66.16	54.46	0.427	0.526	0.762	2.07
02-007-014	Booth Street interceptor	FALSE	69.62	69.62	56.62	0.427	0.526	0.762	2.07
02-007-015	Booth Street interceptor	FALSE	71	71	57.3	0.427	0.526	0.762	2.07
02-007-016	Booth Street interceptor	FALSE	75.66	75.66	57.6	0.427	0.526	0.762	2.07
02-007-017	Booth Street interceptor	FALSE	75.4	75.4	60.44	0.427	0.526	0.762	2.07
02-007-018	Booth Street interceptor	FALSE	75.5	75.5	60.3	0.427	0.526	0.762	2.07
02-007-019	Booth Street interceptor (MS #9)	FALSE	68.47	68.47	60.37	0.427	0.526	0.762	2.07
02-007-020	Booth Street interceptor	FALSE	66.14	66.14	62.54	0.427	0.526	0.754	2.046
02-007-021	Booth Street interceptor	FALSE	66.53	66.53	63.23	0.427	0.526	0.754	2.046
02-007-022	Booth Street interceptor	FALSE	69.81	69.81	63.23	0.311	0.363	0.638	1.883
02-007-023	Booth Street interceptor	FALSE	75.67	75.67	63.82	0.311	0.363	0.638	1.883
02-007-024	Booth Street interceptor	FALSE	75.67	75.67	64.61	0.311	0.363	0.638	1.883
02-007-025	Booth Street interceptor	FALSE	76.44	76.44	64.73	0.311	0.363	0.638	1.883
02-007-026	Booth Street interceptor	FALSE	71.88	71.88	65.68	0.311	0.363	0.638	1.883
02-007-027	Booth Street interceptor	FALSE	83.96	83.96	67.21	0.311	0.363	0.638	1.883
02-007-027-0	Booth Street interceptor	FALSE	85.37	85.37	71.07	0.311	0.363	0.638	1.883
02-007-027-0	Booth Street interceptor	FALSE	84.25	84.25	72.2	0.127	0.179	0.507	1.699
02-007-027-0	Booth Street interceptor	FALSE	85.73	85.73	73.93	0.127	0.179	0.507	1.699
02-007-027-0	Booth Street interceptor	FALSE	95.71	95.71	87.21	0.127	0.179	0.507	1.699
02-007-027-0	Booth Street interceptor	FALSE	99.61	99.61	89.91	0.127	0.179	0.507	1.699
02-007-028	Booth Street interceptor	FALSE	79.38	79.38	69.08	0.311	0.363	0.638	1.883
02-008	West End interceptor	FALSE	22.19	22.19	8.84	0.465	0.733	0.465	0.733
03-001	West End interceptor	FALSE	20.73	20.73	9.23	0.465	0.733	0.465	0.733
03-002	West End interceptor	FALSE	22.35	22.35	9.45	0.465	0.733	0.465	0.733
03-003	West End interceptor	FALSE	22.6	22.6	9.2	0.465	0.733	0.465	0.733

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DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Manhole Information - Southwest Model

Manhole ID	Description	Bolted Cover?	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Average Flow (mgd)	Maximum Flow (mgd)	Future Average Flow (mgd)	Future Maximum Flow (mgd)
03-004	West End interceptor	FALSE	22.37	22.37	9.27	0.465	0.733	0.465	0.733
03-006	West End interceptor	FALSE	17.5	17.5	9.6	0.465	0.733	0.465	0.733
03-007	West End interceptor	FALSE	24.46	24.46	9.96	0.465	0.733	0.465	0.733
03-008	West End interceptor	FALSE	27.6	27.6	10	0.465	0.733	0.465	0.733
03-009	West End interceptor	FALSE	29.22	29.22	10.17	0.465	0.733	0.465	0.733
03-010	West End interceptor	FALSE	24.23	24.23	10.63	0.465	0.733	0.465	0.733
03-011	West End interceptor (MS #5)	FALSE	28.71	28.71	11.01	0.465	0.733	0.465	0.733
03-012	West End interceptor	FALSE	30.4	30.4	11.34	0.465	0.733	0.465	0.733
03-013	West End interceptor	FALSE	31.23	31.23	11.48	0.465	0.733	0.465	0.733
03-014	West End interceptor	FALSE	27.38	27.38	11.83	0.465	0.733	0.465	0.733
03-015	West End interceptor	FALSE	25.15	25.15	12.5	0.465	0.733	0.465	0.733
03-016	West End interceptor	FALSE	27.09	27.09	12.84	0.465	0.733	0.465	0.733
03-017	West End interceptor	FALSE	28.89	28.89	13.04	0.465	0.733	0.465	0.733
03-018	West End interceptor (MS #6)	FALSE	30.49	30.49	13.49	0.465	0.733	0.465	0.733
03-019	West End interceptor	FALSE	35.47	35.47	13.77	0.465	0.733	0.465	0.733
03-021	West End interceptor	FALSE	30.26	30.26	13.96	0.465	0.733	0.465	0.733
03-022	West End interceptor	FALSE	21.7	21.7	14.1	0.465	0.733	0.465	0.733
03-023	West End interceptor	FALSE	21.63	21.63	14.73	0.465	0.733	0.465	0.733
03-024	West End interceptor	FALSE	21.68	21.68	15.18	0.465	0.733	0.465	0.733
03-025	West End interceptor	FALSE	28.68	28.68	15.08	0.093	0.216	0.093	0.216
03-026	West End interceptor	FALSE	28.72	28.72	15.11	0.093	0.216	0.093	0.216
03-027	West End interceptor	FALSE	32.6	32.6	15.4	0.093	0.216	0.093	0.216
03-028	West End interceptor	FALSE	28.4	28.4	15.85	0.093	0.216	0.093	0.216
03-029	West End interceptor	FALSE	31.34	31.34	16.39	0.093	0.216	0.093	0.216
03-030	West End interceptor	FALSE	32.48	32.48	16.68	0.093	0.216	0.093	0.216
03-031	West End interceptor	FALSE	30.38	30.38	16.98	0.093	0.216	0.093	0.216
03-032	West End interceptor	FALSE	31.2	31.2	18.1	0.093	0.216	0.093	0.216
03-033	West End interceptor (MS #7)	FALSE	31.57	31.57	17.47	0.093	0.216	0.093	0.216
03-034	West End interceptor	FALSE	26.88	26.88	17.98	0.093	0.216	0.093	0.216
03-035	West End interceptor	FALSE	28.1	28.1	21.4	0.093	0.216	0.093	0.216
03-036	West End interceptor	FALSE	39.73	39.73	21.6	0	0	0	0

Table C-3
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SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C401	2nd Street Interceptor	CPS WW	04-001	10	-11	-15	10.95	-0.81	-4.81	0.291143	35	48 inch	0.013
C402	2nd Street Interceptor	04-001	04-002	10.95	-0.81	-4.81	6.69	-0.71	-4.71	0.000366	273	48 inch	0.013
C403	2nd Street Interceptor	04-002	04-003	6.69	-0.71	-4.71	9.85	0.15	-3.85	0.00515	167	48 inch	0.013
C404	2nd Street Interceptor	04-003	04-004	9.85	-1.35	-3.85	16.72	-0.38	-2.88	0.002551	380.25	30 inch	0.013
C405	2nd Street Interceptor	04-004	04-005	16.72	-0.38	-2.88	22.56	0.36	-2.14	0.002056	360	30 inch	0.013
C406	2nd Street Interceptor	04-005	04-006	22.56	0.36	-2.14	23.1	0.65	-1.85	0.000722	401.83	30 inch	0.013
C407	2nd Street Interceptor	04-006	04-007	23.1	0.65	-1.85	20.16	0.89	-1.61	0.000722	333	30 inch	0.013
C408	2nd Street Interceptor	04-007	04-008	20.16	0.89	-1.61	20.03	0.93	-1.57	0.000722	55	30 inch	0.013
C409	2nd Street Interceptor	04-008	04-009	20.03	0.93	-1.57	19.87	1.12	-1.38	0.000543	350	30 inch	0.013
C410	2nd Street Interceptor	04-009	04-010	19.87	1.12	-1.38	21.08	1.58	-0.92	0.002479	184	30 inch	0.013
C411	2nd Street Interceptor	04-010	04-011	21.08	1.58	-0.92	20.5	2.17	-0.33	0.002479	240	30 inch	0.013
C412	2nd Street Interceptor	04-011	04-012	20.5	2.17	-0.33	16.37	2.94	0.44	0.002479	310	30 inch	0.013
C413	2nd Street Interceptor	04-012	04-013	16.37	2.94	0.44	14.82	3.43	0.93	0.002479	198	30 inch	0.013
C414	2nd Street Interceptor	04-013	04-014	14.82	3.43	0.93	14.21	3.89	1.39	0.003898	118	30 inch	0.013
C415	2nd Street Interceptor	04-014	04-015	14.21	3.89	1.39	18.86	3.44	0.94	-0.001197	376	30 inch	0.013
C416	2nd Street Interceptor	04-015	04-016	18.86	3.44	0.94	21.07	3.07	0.57	-0.001149	322	30 inch	0.013
C417	2nd Street Interceptor	04-016	04-017	21.07	3.07	0.57	20.92	3.02	0.52	-0.00119	42	30 inch	0.013
C418	2nd Street Interceptor	04-017	04-018	20.92	3.02	0.52	18.89	3.19	0.69	0.000524	324.58	30 inch	0.013
C420	2nd Street Interceptor	04-018	04-020	18.89	3.19	0.69	16.18	3.58	1.08	0.001206	323.25	30 inch	0.013
C421	2nd Street Interceptor	04-020	04-021	16.18	3.58	1.08	13.86	4.76	2.26	0.003669	321.58	30 inch	0.013
C422	2nd Street Interceptor	04-021	04-022	13.86	4.76	2.26	13.96	4.56	2.06	-0.006417	31.17	30 inch	0.013
C501	Penn Street Interceptor	04-003	05-001	9.85	-0.85	-3.85	10.39	0.09	-2.91	0.020435	46	36 inch	0.013
C502	Penn Street Interceptor	05-001	05-002	10.39	0.09	-2.91	11.63	0.58	-2.42	0.001424	344	36 inch	0.013
C503	Penn Street Interceptor	05-002	05-003	11.63	0.58	-2.42	13.7	0.7	-2.3	0.000662	181.33	36 inch	0.013
C504	Penn Street Interceptor	05-003	05-004	13.7	0.7	-2.3	12.59	0.89	-2.11	0.000625	304.17	36 inch	0.013
C505	Penn Street Interceptor	05-004	05-005	12.59	0.89	-2.11	12.35	0.85	-2.15	-0.001548	25.83	36 inch	0.013
C506	Penn Street Interceptor	05-005	05-006	12.35	0.85	-2.15	10.47	2.27	-0.73	0.008765	162	36 inch	0.013
C507	Penn Street Interceptor	05-006	05-007	10.47	2.27	-0.73	19.27	2.67	-0.33	0.001314	304.33	36 inch	0.013
C508	Penn Street Interceptor	05-007	05-008	19.27	2.67	-0.33	19.93	2.78	-0.22	0.003143	35	36 inch	0.013
C509	Penn Street Interceptor	05-008	05-009	19.93	2.78	-0.22	20	2.91	-0.09	0.00057	227.92	36 inch	0.013
C509A	Penn Street Interceptor	05-009	05-009A	20	2.91	-0.09	20	2.99	-0.01	0.00057	138.92	36 inch	0.013
C510	Penn Street Interceptor	05-009A	05-010	20	2.99	-0.01	11.18	3.16	0.16	0.00057	300	36 inch	0.013

Table C-3
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SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C511	Penn Street Interceptor	05-010	05-011	11.18	3.16	0.16	18.67	3.27	0.27	0.000758	145.17	36 inch	0.013
C512	Penn Street Interceptor	05-011	05-012	18.67	3.27	0.27	19.68	3.39	0.39	0.002222	54	36 inch	0.013
C513	Penn Street Interceptor	05-012	05-013	19.68	3.39	0.39	22.19	3.84	0.84	0.002601	173	36 inch	0.013
C514	Penn Street Interceptor	05-013	05-014	22.19	3.84	0.84	16.42	3.82	0.82	-0.000117	171.67	36 inch	0.013
C515	Penn Street Interceptor	05-014	05-015	16.42	3.82	0.82	17.27	3.87	0.87	0.000352	144.67	36 inch	0.013
C515A	Penn Street Interceptor	05-015	05-015A	17.27	3.87	0.87	16.96	3.89	0.89	0.000352	66.75	36 inch	0.013
C516	Penn Street Interceptor	05-015A	05-016	16.96	3.89	0.89	16.21	3.93	0.93	0.000352	100	36 inch	0.013
C517	Penn Street Interceptor	05-016	05-017	16.21	4.93	0.93	15.8	4.98	0.98	0.000352	129.33	48 inch	0.013
C518	Penn Street Interceptor	05-017	05-018	15.8	4.98	0.98	15.39	5.04	1.04	0.000352	170	48 inch	0.013
C519	Penn Street Interceptor	05-018	05-019	15.39	5.04	1.04	15.14	5.07	1.07	0.000352	105	48 inch	0.013
C520	Penn Street Interceptor	05-019	05-020	15.14	5.07	1.07	14.78	5.12	1.12	0.000352	150	48 inch	0.013
C520A	Chester Cr. W. Interceptor	05-020	05-020A	14.78	5.12	1.12	14.61	5.21	1.21	0.001216	70	48 inch	0.013
C521	Chester Cr. W. Interceptor	05-020A	05-021	14.61	5.21	1.21	14.3	5.3	1.3	0.000642	140.08	48 inch	0.013
C522	Chester Cr. W. Interceptor	05-021	05-022	14.3	5.3	1.3	15.06	6	2	0.018962	36.92	48 inch	0.013
C523	Chester Cr. W. Interceptor	05-022	05-023	15.06	5	2	18.18	5.17	2.17	0.000917	185.42	36 inch	0.013
C524	Chester Cr. W. Interceptor	05-023	05-024	18.18	5.17	2.17	14.33	5.93	2.93	0.002303	330	36 inch	0.013
C525	Chester Cr. W. Interceptor	05-024	05-025	14.33	5.93	2.93	16.24	6.03	3.03	0.000258	395.42	36 inch	0.013
C526	Chester Cr. W. Interceptor	05-025	05-026	16.24	6.03	3.03	23.31	6.07	3.07	0.000258	140	36 inch	0.013
C527	Chester Cr. W. Interceptor	05-026	05-027	23.31	6.07	3.07	16.55	6.15	3.15	0.000258	325	36 inch	0.013
C528	Chester Cr. W. Interceptor	05-027	05-028	16.55	6.15	3.15	14.38	6.18	3.18	0.000258	100	36 inch	0.013
C529	Chester Cr. W. Interceptor	05-028	05-029	14.38	6.18	3.18	15.86	6.26	3.26	0.000258	320.17	36 inch	0.013
C530	Chester Cr. W. Interceptor	05-029	05-030	15.86	6.26	3.26	14.51	6.66	3.66	0.00396	101	36 inch	0.013
C531	Chester Cr. W. Interceptor	05-030	05-031	14.51	6.66	3.66	16.06	10.39	7.39	0.010657	350	36 inch	0.013
C532	Chester Cr. W. Interceptor	05-031	05-032	16.06	9.06	7.39	17.97	9.24	7.57	0.000275	663	20 inch	0.011
C533	Chester Cr. W. Interceptor	05-032	05-033	17.97	9.24	7.57	18.95	9.33	7.66	0.000275	338	20 inch	0.011
C534	Chester Cr. W. Interceptor	05-033	05-034	18.95	9.33	7.66	19.27	9.36	7.7	0.000275	112.25	20 inch	0.011
C601	Edgmont Ave. Interceptor	07-003	06-001	8.35	-7.12	-8.45	8.19	0.27	-1.06	0.123167	60	16 inch	0.013
C602	Edgmont Ave. Interceptor	06-001	06-002	8.19	0.44	-1.06	10.4	0.8	-0.7	0.001647	217	18 inch	0.013
C602A	Edgmont Ave. Interceptor	06-002	06-002A	10.4	0.8	-0.7	11.54	1.19	-0.31	0.002145	183	18 inch	0.013
C603	Edgmont Ave. Interceptor	06-002A	06-003	11.54	1.19	-0.31	12.68	1.58	0.08	0.004432	88	18 inch	0.013
C604	Edgmont Ave. Interceptor	06-003	06-004	12.68	1.58	0.08	14.06	2.46	0.96	0.001853	475	18 inch	0.013
C605	Edgmont Ave. Interceptor	06-004	06-005	14.06	2.46	0.96	17.06	2.81	1.31	0.003844	90	18 inch	0.013

Table C-3
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SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C606	Edgmont Ave. Interceptor	06-005	06-006	17.06	2.81	1.31	24.65	3.4	1.9	0.003578	166	18 inch	0.013
C607	Edgmont Ave. Interceptor	06-006	06-007	24.65	3.4	1.9	24.3	4.1	2.6	0.002456	285	18 inch	0.013
C608	Edgmont Ave. Interceptor	06-007	06-008	24.3	4.1	2.6	21.8	4.15	2.65	0.000151	330.33	18 inch	0.013
C609	Edgmont Ave. Interceptor	06-008	06-009	21.8	4.15	2.65	22.1	4.09	2.59	-0.000283	214.83	18 inch	0.013
C610	Edgmont Ave. Interceptor	06-009	06-010	22.1	4.09	2.59	23.75	3.75	2.25	-0.008928	38	18 inch	0.013
C611	Edgmont Ave. Interceptor	06-010	06-011	23.75	3.75	2.25	23.19	4.7	3.2	0.004474	212.33	18 inch	0.013
C612	Edgmont Ave. Interceptor	06-011	06-012	23.19	4.7	3.2	23.21	4.71	3.21	0.000051	195.17	18 inch	0.013
C613	Edgmont Ave. Interceptor	06-012	06-013	23.21	4.71	3.21	21.37	5.31	3.81	0.06	10	18 inch	0.013
C614	Edgmont Ave. Interceptor	06-013	06-014	21.37	5.31	3.81	16.28	5.45	3.95	0.000477	293.5	18 inch	0.013
C615	Edgmont Ave. Interceptor	06-014	06-015	16.28	5.28	3.95	17.03	5.31	3.98	0.000098	307	16 inch	0.013
C701	Ridley Creek Interceptor	NSYPHON	07-001	7.13	-6.17	-9.17	7.13	-5.82	-8.82	0.006452	55	36 inch	0.013
C702	Ridley Creek Interceptor	07-001	07-002	7.13	-5.82	-8.82	8.33	-4.42	-7.42	0.029167	48	36 inch	0.013
C703	Ridley Creek Interceptor	07-002	07-003	8.33	-4.42	-7.42	8.35	-5.45	-8.45	-0.0412	25	36 inch	0.013
C704	Ridley Creek Interceptor	07-003	07-004	8.35	-5.45	-8.45	10.01	-4.99	-7.99	0.000958	480	36 inch	0.013
C705	Ridley Creek Interceptor	07-004	07-005	10.01	-4.99	-7.99	9.99	-4.86	-7.86	0.002484	52.33	36 inch	0.013
C706	Ridley Creek Interceptor	07-005	07-006	9.99	-4.86	-7.86	7.89	-4.16	-7.16	0.001755	398.75	36 inch	0.013
C707	Ridley Creek Interceptor	07-006	07-007	7.89	-4.16	-7.16	8.66	-4.19	-7.19	-0.000349	86	36 inch	0.013
C708	Ridley Creek Interceptor	07-007	07-008	8.66	-4.19	-7.19	9.22	-3.98	-6.98	0.000698	300.67	36 inch	0.013
C709	Ridley Creek Interceptor	07-008	07-009	9.22	-3.98	-6.98	9.46	-3.84	-6.84	0.001434	95.75	36 inch	0.013
C710	Ridley Creek Interceptor	07-009	07-010	9.46	-3.84	-6.84	9.86	-3.04	-6.04	0.001434	561	36 inch	0.013
C711	Ridley Creek Interceptor	07-010	07-011	9.86	-3.04	-6.04	8.74	-2.6	-5.6	0.001434	305.33	36 inch	0.013
C712	Ridley Creek Interceptor	07-011	07-012	8.74	-2.6	-5.6	10.69	-2.31	-5.31	0.000725	400	36 inch	0.013
C713	Ridley Creek Interceptor	07-012	07-013	10.69	-2.31	-5.31	9.13	-2.47	-5.47	-0.000358	447	36 inch	0.013
C714	Ridley Creek Interceptor	07-013	07-014	9.13	-2.47	-5.47	15.81	-2.24	-5.24	0.000816	287	36 inch	0.013
C715	Ridley Creek Interceptor	07-014	07-015	15.81	-2.24	-5.24	17.05	-1.95	-4.95	0.000816	350	36 inch	0.013
C716	Ridley Creek Interceptor	07-015	07-016	17.05	-1.95	-4.95	16.07	-1.73	-4.73	0.00059	373	36 inch	0.013
C717	Ridley Creek Interceptor	07-016	07-017	16.07	-1.73	-4.73	14.37	-1.43	-4.43	0.000806	371.33	36 inch	0.013
C718	Ridley Creek Interceptor	07-017	07-018	14.37	-1.43	-4.43	17.64	-1.31	-4.31	0.000806	149.5	36 inch	0.013
C719	Ridley Creek Interceptor	07-018	07-019	17.64	-1.31	-4.31	12.5	-0.9	-3.9	0.001093	375	36 inch	0.013
C720	Ridley Creek Interceptor	07-019	07-020	12.5	-0.9	-3.9	12.06	-0.64	-3.64	0.0104	25	36 inch	0.013
C721	Ridley Creek Interceptor	07-020	07-021	12.06	-1.14	-3.64	9.06	-0.54	-3.04	0.001795	334.25	30 inch	0.013
C722	Ridley Creek Interceptor	07-021	07-022	9.06	-0.54	-3.04	8.39	-0.96	-3.46	-0.00506	83	30 inch	0.013

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Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C723	Ridley Creek Interceptor	07-022	07-023	8.39	-0.96	-3.46	7.13	-0.82	-3.32	0.000611	229	30 inch	0.013
C724	Ridley Creek Interceptor	07-023	07-024	7.13	-0.82	-3.32	7.07	-0.63	-3.13	0.000864	220	30 inch	0.013
C725	Ridley Creek Interceptor	07-024	07-025	7.07	-0.63	-3.13	9.92	-0.16	-2.66	0.001806	260.25	30 inch	0.013
C726	Ridley Creek Interceptor	07-025	07-026	9.92	-0.16	-2.66	11.83	0.58	-1.92	0.003217	230	30 inch	0.013
C727	Ridley Creek Interceptor	07-026	07-027	11.83	0.58	-1.92	11.6	0.6	-1.9	0.000333	60	30 inch	0.013
C728	Ridley Creek Interceptor	07-027	07-028	11.6	0.6	-1.9	12.09	1.79	-0.71	0.026444	45	30 inch	0.013
C729	Ridley Creek Interceptor	07-028	07-029	12.09	1.79	-0.71	10.44	2.14	-0.36	0.000998	350.67	30 inch	0.013
C730	Ridley Creek Interceptor	07-029	07-030	10.44	2.14	-0.36	13.94	2.54	0.04	0.00106	377.33	30 inch	0.013
C731	Ridley Creek Interceptor	07-030	07-031	13.94	2.54	0.04	8.84	2.71	0.21	0.001308	130	30 inch	0.013
C732	Ridley Creek Interceptor	07-031	07-032	8.84	2.71	0.21	9.01	2.66	0.16	-0.000109	459	30 inch	0.013
C733	Ridley Creek Interceptor	07-032	07-033	9.01	2.66	0.16	9.18	3.08	0.58	0.001714	245	30 inch	0.013
C734	Ridley Creek Interceptor	07-033	07-034	9.18	3.08	0.58	8.87	3.36	0.86	0.001414	198	30 inch	0.013
C735	Ridley Creek Interceptor	07-034	07-035	8.87	3.36	0.86	8.51	3.36	0.86	0	300	30 inch	0.013
C736	Ridley Creek Interceptor	07-035	07-036	8.51	3.36	0.86	7.47	3.75	1.25	0.001696	230	30 inch	0.013
C737	Ridley Creek Interceptor	07-036	07-037	7.47	3.75	1.25	13.6	3.9	1.4	0.000278	540	30 inch	0.013
C738	Ridley Creek Interceptor	07-037	07-038	13.6	3.9	1.4	14.27	4.42	1.92	0.003371	154.25	30 inch	0.013
C739	Ridley Creek Interceptor	07-038	07-039	14.27	4.42	1.92	12.84	4.59	2.09	0.002974	57.17	30 inch	0.013
C740	Ridley Creek Interceptor	07-039	07-040	12.84	4.59	2.09	13.75	4.15	1.65	-0.001512	291	30 inch	0.013
C741	Ridley Creek Interceptor	07-040	07-041	13.75	4.15	1.65	12.27	4.47	1.97	0.002667	120	30 inch	0.013
C742	Ridley Creek Interceptor	07-041	07-042	12.27	4.47	1.97	14.64	4.49	1.99	0.00008	250.08	30 inch	0.013
C743	Ridley Creek Interceptor	07-042	07-043	14.64	4.49	1.99	16.16	4.96	2.46	0.0018	261.17	30 inch	0.013
C744	Ridley Creek Interceptor	07-043	07-044	16.16	4.96	2.46	19.36	5.33	2.83	0.001703	217.25	30 inch	0.013
C745	Ridley Creek Interceptor	07-044	07-045	19.36	5.33	2.83	29.25	5.25	2.75	-0.000299	268	30 inch	0.013
C746	Ridley Creek Interceptor	07-045	07-046	29.25	5.25	2.75	17.41	5.55	3.05	0.001661	180	30 inch	0.013
C747	Ridley Creek Interceptor	07-046	07-047	17.41	5.55	3.05	9.84	5.74	3.24	0.001661	115	30 inch	0.013
C748	Ridley Creek Interceptor	07-047	07-048	9.84	5.74	3.24	12.14	5.88	3.38	0.000428	327	30 inch	0.013
C750a	Ridley Creek Interceptor	07-048	07-050a	12.14	5.88	3.38	15.61	6.16	3.66	0.0028	100	30 inch	0.013
C751a	Ridley Creek Interceptor	07-050a	07-051a	15.61	6.16	3.66	16.29	6.41	3.91	0.000769	325	30 inch	0.013
C752	Ridley Creek Interceptor	07-051a	07-052	16.29	6.41	3.91	14.1	6.57	4.07	0.00064	250	30 inch	0.013
C753	Ridley Creek Interceptor	07-052	07-053	14.1	6.57	4.07	12.06	6.57	4.07	0	240	30 inch	0.013
C754	Ridley Creek Interceptor	07-053	07-054	12.06	6.57	4.07	12.06	6.83	4.33	0.0013	200	30 inch	0.013
C755	Ridley Creek Interceptor	07-054	07-055	12.06	6.83	4.33	15.75	6.9	4.4	0.000386	181.17	30 inch	0.013

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Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C756	Ridley Creek Interceptor	07-055	07-056	15.75	6.9	4.4	31.35	7.45	4.95	0.0125	44	30 inch	0.013
C757	Ridley Creek Interceptor	07-056	07-057	31.35	7.45	4.95	28.68	7.4	4.9	-0.000526	95	30 inch	0.013
C758	Ridley Creek Interceptor	07-057	07-058	28.68	7.4	4.9	10.61	7.36	4.86	-0.000916	43.67	30 inch	0.013
C759	Ridley Creek Interceptor	07-058	07-059	10.61	7.36	4.86	13.44	7.34	4.84	-0.000105	190	30 inch	0.013
C759A	Ridley Creek Interceptor	07-059	07-059A	13.44	7.34	4.84	15.86	9.58	7.08	0.006235	360	30 inch	0.013
C760	Ridley Creek Interceptor	07-059A	07-060	15.86	9.58	7.08	16.94	10.58	8.08	0.006235	160	30 inch	0.013
C762	Ridley Creek Interceptor	07-060	07-062	16.94	10.58	8.08	18.28	11.83	9.33	0.006235	200	30 inch	0.013
C764	Ridley Creek Interceptor	07-063	07-064	18.79	12.3	9.8	19.46	12.92	10.42	0.003711	168	30 inch	0.013
C765	Ridley Creek Interceptor	07-064	07-066	19.46	12.92	10.42	22.34	17.79	15.29	0.01182	412	30 inch	0.013
C768	Ridley Creek Interceptor	07-066	07-068	22.34	17.79	15.29	22.7	17.8	15.3	0.000025	400	30 inch	0.013
C769	Ridley Creek Interceptor	07-068	07-069	22.7	17.3	15.3	23	17.32	15.32	0.000039	513	24 inch	0.013
C770	Ridley Creek Interceptor	07-069	07-070	23	17.32	15.32	23	17.36	15.36	0.000171	234	24 inch	0.013
C771	Ridley Creek Interceptor	07-070	07-071	23	17.36	15.36	23	17.4	15.4	0.000092	433	24 inch	0.013
C772	Ridley Creek Interceptor	07-071	07-072	23	17.15	15.4	23	17.19	15.44	0.000137	292	21 inch	0.013
C773	Ridley Creek Interceptor	07-072	07-073	23	17.19	15.44	23	17.23	15.48	0.000161	248.75	21 inch	0.013
C774	Ridley Creek Interceptor	07-073	07-074	23	17.23	15.48	23	17.29	15.54	0.000211	284.5	21 inch	0.013
C775	Ridley Creek Interceptor	07-074	07-075	23	17.29	15.54	23	17.33	15.58	0.000126	316.42	21 inch	0.013
C776	Ridley Creek Interceptor	07-075	07-076	23	17.33	15.58	23	17.37	15.62	0.000162	247.25	21 inch	0.013
C777	Ridley Creek Interceptor	07-076	07-077	23	17.37	15.62	23	17.44	15.69	0.000318	220	21 inch	0.013
C778	Ridley Creek Interceptor	07-077	07-078	23	17.44	15.69	23	17.48	15.73	0.000222	180	21 inch	0.013
C779	Ridley Creek Interceptor	07-078	07-079	23	17.48	15.73	23	17.52	15.77	0.000123	325	21 inch	0.013
C780	Ridley Creek Interceptor	07-079	07-080	23	17.52	15.77	23	17.54	15.79	0.000031	650.42	21 inch	0.013
C781	Ridley Creek Interceptor	07-080	07-081	23	17.54	15.79	23	17.56	15.81	0.00007	285	21 inch	0.013
C782	Ridley Creek Interceptor	07-081	07-082	23	17.56	15.81	23	17.59	15.84	0.00008	373	21 inch	0.013
C783	Ridley Creek Interceptor	07-082	07-083	23	17.59	15.84	24.25	17.63	15.88	0.000333	120	21 inch	0.013
C784	Ridley Creek Interceptor	07-083	07-084	24.25	17.63	15.88	24.01	19.16	17.41	0.0153	100	21 inch	0.013
C785	Ridley Creek Interceptor	07-084	07-085	24.01	18.91	17.41	26.71	21.86	20.36	0.007375	400	18 inch	0.013
C786	Ridley Creek Interceptor	07-085	07-086	26.71	21.86	20.36	31.83	23.23	21.73	0.006816	201	18 inch	0.013
C787	Ridley Creek Interceptor	07-086	07-087	31.83	23.23	21.73	30.52	24.42	22.92	0.003906	304.67	18 inch	0.013
C788	Ridley Creek Interceptor	07-087	07-088	30.52	24.42	22.92	32.1	25.8	24.3	0.004282	322.25	18 inch	0.013

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Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C789	Ridley Creek Interceptor	07-088	07-089	32.1	25.8	24.3	32.5	26.24	24.74	0.001257	350	18 inch	0.013
C790	Ridley Creek Interceptor	07-089	07-090	32.5	26.24	24.74	32.78	26.68	25.18	0.001332	330.33	18 inch	0.013
C791	Ridley Creek Interceptor	07-090	07-091	32.78	26.68	25.18	32.78	27.51	26.01	0.013794	60.17	18 inch	0.013
C792	Ridley Creek Interceptor	07-091	07-092	32.78	27.51	26.01	33.07	28.34	26.84	0.002855	290.67	18 inch	0.013
C40201	Dock Street Extension	04-002	04-002-001	6.69	-3.38	-4.71	8.67	2.33	1	0.014061	406.08	16 inch	0.011
C40202	Dock Street Extension	04-002-001	04-002-002	8.67	2.33	1	8.92	2.41	1.08	0.002286	35	16 inch	0.011
C52001	Chester Cr. E. Interceptor	05-020A	05-020-001	14.61	3.21	1.21	12.56	3.15	1.15	-0.000202	320.5	24 inch	0.013
C52002	Chester Cr. E. Interceptor	05-020-001	05-020-002	12.56	3.15	1.15	9.79	3.08	1.08	-0.000202	318.75	24 inch	0.013
C52003	Chester Cr. E. Interceptor	05-020-002	05-020-003	9.79	3.08	1.08	15.35	3.05	1.05	-0.000202	151.83	24 inch	0.013
C52004	Chester Cr. E. Interceptor	05-020-003	05-020-004	15.35	3.05	1.05	19.75	7.5	5.5	0.009172	484.83	24 inch	0.013
C52005	Chester Cr. E. Interceptor	05-020-004	05-020-005	19.75	7.5	5.5	15.12	11.62	9.62	0.009172	450	24 inch	0.013
C52006	Chester Cr. E. Interceptor	05-020-005	05-020-006	15.12	11.62	9.62	20.89	11.99	9.99	0.009172	40.33	24 inch	0.013
C52007	Chester Cr. E. Interceptor	05-020-006	05-020-007	20.89	10.99	9.99	27.55	12.75	11.75	0.009172	191.92	12 inch	0.013
C52008	Chester Cr. E. Interceptor	05-020-007	05-020-008	27.55	12.75	11.75	27.68	13.12	12.12	0.009172	40	12 inch	0.013
C52009	Chester Cr. E. Interceptor	05-020-008	05-020-009	27.68	13.12	12.12	24.66	14.91	13.91	0.009172	195	12 inch	0.013
C52010	Chester Cr. E. Interceptor	05-020-009	05-020-010	24.66	14.91	13.91	29.1	16	15	0.009909	110	12 inch	0.013
C53401	Chester Cr. W. Interceptor	05-034	05-034-001	19.27	8.7	7.7	16.83	8.73	7.73	0.000275	125	12 inch	0.011
C53402	Chester Cr. W. Interceptor	05-034-001	05-034-002	16.83	8.73	7.73	27.99	9.99	8.99	0.00395	319	12 inch	0.011
CNSYPHON-1	Chester River Siphon	JC-3	upstream end of syphon	-4.33	-12.41	-15.28	-4.33	-6.53	-9.4	1.306667	4.5	34.4 inch	0.012
CNSYPHON-2	Chester River Siphon	JC-4	JC-3	0.5	-14.45	-17.32	-4.33	-12.41	-15.28	0.023529	86.7	34.4 inch	0.012
CNSYPHON-3	Chester River Siphon	downstream end of syphon	JC-4	0.5	-8.45	-11.32	0.5	-14.45	-17.32	-0.418994	14.32	34.4 inch	0.012
inlet- ridley	Ridley Creek Siphon	JC-8	07-063	18	14.8	9.8	18.79	14.8	9.8	-0.000192	18	3 x 5 ft	0.013
Inlet 1	Chester River Siphon	JC-2	NSYPHON	-4.33	-6.4	-9.4	7.13	-6.17	-9.17	0.001491	151	4 x 3 ft	0.013
Inlet 2	Chester River Siphon	upstream end of syphon	JC-2	-4.33	-5.4	-9.4	-4.33	-5.4	-9.4	0	11	12 x 4 ft	0.013
Outlet	Chester River Siphon	CPS WW	downstream end of syphon	10	-6.32	-11.32	0.5	-6.32	-11.32	0	11	12 x 5 ft	0.013
outlet- ridley	Ridley Creek Siphon	07-062	JC-9	18.28	15.33	9.33	18	15.33	9.33	0.000096	11	10 x 6 ft	0.013
P-189	Ridley Creek Siphon	siphon1	JC-8	10	-1.35	-2.35	18	10.8	9.8	1	12.15	12 inch	0.012

Table C-3
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SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
P-190	Ridley Creek Siphon	siphon2	siphon1	10	-2.35	-3.35	10	-1.35	-2.35	0.00726	137.75	12 inch	0.012
P-191	Ridley Creek Siphon	JC-9	siphon2	18	10.33	9.33	10	-2.35	-3.35	-1.056667	12	12 inch	0.012

Table C-3
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SewerCAD Model Pipe Information - Northeast Model

		Average Flow						Maximum Flow					
Pipe Label	Full Capacity (mgd)	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C401	500.911	8.8	12	4.141	-14	-4.08	Composite S1 S2	11.9	12	7.485	-14	-3.82	Composite S1 S2
C402	17.767	13.7	11.9	4.141	-3.82	-3.57	M2	18.3	16.1	7.485	-3.46	-3.19	M2
C403	66.619	8.8	14.6	4.141	-3.49	-3.12	Composite S1 S2	11.9	19.6	7.485	-3.08	-2.86	Composite S1 S2
C404	13.389	6.9	11.9	1.57	-2.86	-2.3	M1	10.4	16.1	3.435	-2.5	-2.02	M1
C405	12.019	7.3	8.4	1.57	-2.18	-1.53	M1	11	12.7	3.435	-1.82	-1.23	M1
C406	7.121	9.4	8.6	1.57	-1.42	-1.06	M2	14.2	13	3.435	-1.06	-0.67	M2
C407	7.121	9.7	10.1	1.57	-1.01	-0.8	M1	14.9	15.2	3.435	-0.58	-0.37	M1
C408	7.121	10.1	10.3	1.386	-0.75	-0.73	M1	15.6	15.8	3.1	-0.29	-0.27	M1
C409	6.176	9.9	10.5	1.315	-0.7	-0.56	M1	15.7	16.3	2.97	-0.21	-0.08	M1
C410	13.197	6.5	10.3	1.315	-0.53	-0.38	M1	11.6	16.2	2.97	-0.03	0.04	M1
C411	13.197	6.4	7.8	1.315	-0.28	0.2	M1	9.7	12.9	2.97	0.15	0.48	M1
C412	13.197	6.4	7.7	1.315	0.31	0.97	M1	9.7	11.8	2.97	0.65	1.25	M1
C413	13.197	6.4	7.7	1.315	1.08	1.46	M1	9.7	11.8	2.97	1.42	1.74	M1
C414	16.551	5.7	7.7	1.315	1.57	1.87	M1	8.6	11.8	2.97	1.91	2.11	M1
C415	-9.171	14.4	7.5	0.924	2.02	2.14	A2	19	11.5	2.247	2.35	2.52	A2
C416	-8.986	19.1	14.5	0.924	2.15	2.16	A2	24.1	19.2	2.247	2.54	2.58	A2
C417	-9.146	19.7	19.1	0.924	2.16	2.17	A2	24.8	24.2	2.247	2.59	2.59	A2
C418	6.067	17.8	19.8	0.924	2.17	2.18	M1	23.2	25	2.247	2.6	2.62	M1
C420	9.208	13.3	17.9	0.663	2.18	2.18	M1	18.9	23.3	1.765	2.63	2.65	M1
C421	16.058	4.2	13.3	0.663	2.19	2.61	M1	6.7	19	1.765	2.66	2.82	M1
C422	-21.235	8.4	5.3	0.663	2.7	2.76	A2	12	8.8	1.765	2.99	3.06	A2
C501	61.62	7.5	11.9	2.571	-2.86	-2.29	Composite S1 S2	9.4	16.1	4.05	-2.5	-2.12	Composite S1 S2
C502	16.269	9.7	10.1	2.571	-2.07	-1.61	M1	12.3	12.8	4.05	-1.84	-1.4	M1
C503	11.089	11.4	10.9	2.571	-1.51	-1.35	M2	14.4	13.9	4.05	-1.26	-1.1	M2
C504	10.774	12.1	12.2	2.571	-1.29	-1.11	M1	15.4	15.4	4.05	-1.02	-0.83	M1
C505	-16.962	13.4	12.7	2.571	-1.05	-1.03	A2	17	16.2	4.05	-0.76	-0.74	A2
C506	40.357	7.5	13.9	2.571	-0.99	-0.11	Composite S1 S2	9.4	17.6	4.05	-0.68	0.06	Composite S1 S2
C507	15.628	9.4	10.1	2.289	0.11	0.45	M1	11.9	12.8	3.624	0.34	0.66	M1
C508	24.166	9.3	10.5	2.289	0.54	0.55	M1	12.1	13.3	3.624	0.78	0.79	M1
C509	10.29	11	10.4	2.289	0.65	0.83	M2	14	13.5	3.624	0.9	1.08	M2
C509A	10.29	11.7	11.7	2.289	0.89	0.96	M1	14.9	14.9	3.624	1.15	1.23	M1
C510	10.29	11.9	12.3	2.285	1.01	1.15	M1	15.3	15.6	3.618	1.29	1.43	M1

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Pipe Label	Full Capacity (mgd)	Average Flow						Maximum Flow					
		Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C511	11.866	11.9	12.5	2.251	1.2	1.26	M1	15.4	16	3.56	1.49	1.55	M1
C512	20.32	11.1	12.4	2.251	1.3	1.32	M1	14.8	16.1	3.56	1.61	1.62	M1
C513	21.985	8	11.8	2.251	1.37	1.5	M1	11	15.5	3.56	1.68	1.76	M1
C514	-4.653	11.9	9.6	2.247	1.64	1.81	A2	14.8	12.7	3.553	1.9	2.06	A2
C515	8.089	12.5	12.4	2.247	1.86	1.92	M2	15.8	15.6	3.553	2.12	2.18	M2
C515A	8.089	13	13	2.247	1.96	1.98	M1	16.4	16.4	3.553	2.24	2.26	M2
C516	8.089	13.4	13.4	2.247	2.01	2.04	M1	17	17	3.553	2.31	2.34	M1
C517	17.421	13.5	13.8	2.247	2.08	2.1	M1	17.2	17.5	3.553	2.39	2.41	M1
C518	17.421	13.4	13.8	2.159	2.12	2.15	M1	17.2	17.6	3.425	2.44	2.47	M1
C519	17.421	13.4	13.7	2.159	2.17	2.19	M1	17.3	17.5	3.425	2.49	2.51	M1
C520	17.421	13.3	13.7	2.159	2.21	2.24	M1	17.2	17.6	3.425	2.54	2.56	M1
C520A	32.37	12.7	13.6	2.159	2.26	2.27	M1	16.6	17.6	3.425	2.59	2.6	M1
C521	23.531	12	13	0.674	2.29	2.3	M1	15.9	17	1.154	2.63	2.63	M1
C522	127.834	3.5	12	0.674	2.3	2.29	Composite S1 S2	7.3	16	1.154	2.63	2.61	S1
C523	13.052	5.5	4.7	0.674	2.39	2.63	M2	7.4	7.7	1.154	2.64	2.78	M1
C524	20.686	4.5	5.9	0.674	2.66	3.3	M1	5.8	7.9	1.154	2.83	3.41	M1
C525	6.92	6.9	5.3	0.674	3.37	3.61	M2	8.9	6.9	1.154	3.5	3.77	M2
C526	6.92	7.3	7.2	0.674	3.63	3.67	M2	9.3	9.2	1.154	3.8	3.85	M2
C527	6.92	7.5	7.5	0.654	3.69	3.77	M2	9.7	9.6	1.123	3.87	3.96	M2
C528	6.92	7.6	7.6	0.654	3.79	3.81	M1	9.9	9.9	1.123	3.98	4	M1
C529	6.92	7.7	7.8	0.654	3.83	3.9	M1	10	10.1	1.123	4.02	4.1	M1
C530	27.127	3.7	7.8	0.594	3.91	3.97	M1	5.5	10.2	1.031	4.11	4.12	M1
C531	44.5	3.6	4.8	0.594	4.06	7.69	Composite S1 S2	4.7	6.5	1.031	4.2	7.78	Composite S1 S2
C532	1.761	7.6	4.8	0.594	7.79	8.2	M2	10	6.3	1.031	7.92	8.41	M2
C533	1.761	7.9	7.9	0.594	8.23	8.32	M2	10.6	10.4	1.031	8.44	8.55	M2
C534	1.761	8.1	8.2	0.594	8.35	8.37	M1	11	10.9	1.031	8.58	8.61	M2
C601	17.403	2.1	26.7	0.144	-6.23	-0.88	Composite Pressure S1 S2	4	30.9	0.483	-5.87	-0.73	Composite Pressure S1 S2
C602	2.755	2.8	2.9	0.144	-0.82	-0.47	M1	5.1	5.4	0.483	-0.61	-0.28	M1
C602A	3.144	2.6	3.1	0.144	-0.44	-0.09	M1	4.8	5.7	0.483	-0.23	0.09	M1
C603	4.519	2.2	3	0.144	-0.06	0.26	M1	4	5.5	0.483	0.15	0.41	M1
C604	2.922	2.5	2.8	0.126	0.31	1.17	M1	4.7	5.2	0.434	0.51	1.35	M1
C605	4.209	2.1	2.9	0.126	1.2	1.48	M1	3.9	5.3	0.434	1.4	1.63	M1

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Pipe Label	Full Capacity (mgd)	Average Flow						Maximum Flow					
		Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C606	4.061	2.2	2.6	0.126	1.53	2.08	M1	4	5	0.434	1.72	2.23	M1
C607	3.364	2.4	2.7	0.126	2.12	2.8	M1	4.4	5	0.434	2.31	2.96	M1
C608	0.835	4.1	2.8	0.126	2.83	2.99	M2	7.2	5.1	0.434	3.03	3.25	M2
C609	-1.141	5.2	4.2	0.105	3	3.03	A2	8.6	7.4	0.374	3.27	3.31	A2
C610	-6.415	9.4	5.3	0.105	3.03	3.03	A2	12.9	8.7	0.374	3.32	3.32	A2
C611	4.541	1.9	9.4	0.105	3.03	3.36	M1	3.5	12.9	0.374	3.33	3.49	M1
C612	0.486	3.8	2.4	0.105	3.4	3.52	M2	6.5	4.6	0.374	3.58	3.75	M2
C613	16.629	1.7	3.8	0.1	3.53	3.95	Composite S1 S2	3.3	6.7	0.36	3.77	4.09	Composite S1 S2
C614	1.483	3.1	2.3	0.1	4	4.21	M2	5.8	4.5	0.36	4.18	4.43	M2
C615	0.49	4	3.2	0.1	4.22	4.32	M2	7.3	6	0.36	4.45	4.59	M2
C701	34.624	9.4	11.3	4.017	-8.24	-8.04	Composite S1 S2	12.1	15.5	6.563	-7.89	-7.81	Composite S1 S2
C702	73.617	9.4	12.7	4.017	-7.76	-6.64	Composite S1 S2	12.1	16.5	6.563	-7.44	-6.41	Composite S1 S2
C703	-87.496	26.4	12.7	4.017	-6.36	-6.25	A2	30.5	16.5	6.563	-6.04	-5.91	A2
C704	13.344	21.8	26.7	3.873	-6.23	-6.18	M1	26.5	30.9	6.081	-5.87	-5.78	M1
C705	21.484	20.6	22.1	3.873	-6.15	-6.14	M1	25.6	27.1	6.081	-5.74	-5.73	M1
C706	18.061	13.9	21	3.848	-6.11	-6	M1	19.1	26.2	6.04	-5.68	-5.56	M1
C707	-8.051	16	15	3.848	-5.91	-5.86	A2	21.2	20.3	6.04	-5.47	-5.42	A2
C708	11.392	15.6	16.7	3.661	-5.8	-5.68	M1	20.9	22.1	5.743	-5.35	-5.24	M1
C709	16.326	15.1	16.3	3.661	-5.62	-5.59	M1	20.5	21.7	5.743	-5.17	-5.14	M1
C710	16.326	11.7	15.8	3.661	-5.52	-5.06	M1	15.7	21.3	5.743	-5.07	-4.73	M1
C711	16.326	11.8	13.2	3.661	-4.94	-4.62	M1	15.4	17.4	5.743	-4.59	-4.32	M1
C712	11.607	13.7	13.3	3.661	-4.5	-4.17	M2	17.6	17.2	5.743	-4.17	-3.84	M2
C713	-8.155	19.2	14.7	3.661	-4.09	-3.87	A2	23.5	18.8	5.743	-3.74	-3.51	A2
C714	12.316	17.6	19.6	3.661	-3.84	-3.77	M1	22.3	24.1	5.743	-3.46	-3.38	M1
C715	12.316	16	18.1	3.661	-3.73	-3.62	M1	21	23	5.743	-3.32	-3.2	M1
C716	10.469	15.8	16.6	3.661	-3.56	-3.42	M1	20.9	21.8	5.743	-3.13	-2.99	M1
C717	12.241	14.8	16.4	3.661	-3.36	-3.2	M1	19.9	21.7	5.743	-2.92	-2.77	M1
C718	12.241	14.9	15.6	3.324	-3.13	-3.07	M1	20	20.9	5.214	-2.69	-2.64	M1
C719	14.253	12.9	15.5	3.324	-3.02	-2.83	M1	17.7	20.8	5.214	-2.58	-2.42	M1
C720	43.96	9.8	13.8	3.324	-2.75	-2.82	S1	15.2	18.7	5.214	-2.34	-2.37	S1
C721	11.231	11.2	11.8	3.324	-2.65	-2.11	M1	14.6	16.7	5.214	-2.25	-1.82	M1
C722	-18.857	19.3	13	3.324	-1.96	-1.85	A2	23.3	16.8	5.214	-1.64	-1.52	A2

Table C-3
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Pipe Label	Full Capacity (mgd)	Average Flow						Maximum Flow					
		Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C723	6.554	18.7	19.8	3.055	-1.81	-1.76	M1	23.3	24	4.824	-1.46	-1.38	M1
C724	7.79	17.5	19.1	3.044	-1.73	-1.67	M1	22.5	23.9	4.808	-1.33	-1.25	M1
C725	11.265	13.4	17.9	3.044	-1.63	-1.55	M1	18.7	23.2	4.808	-1.2	-1.1	M1
C726	15.036	9.2	14.3	3.044	-1.47	-1.16	M1	12.5	19.7	4.808	-1.02	-0.88	M1
C727	4.84	12.5	11.7	3.044	-0.94	-0.86	M2	16	15.2	4.808	-0.65	-0.57	M2
C728	43.108	8.2	13.6	2.775	-0.77	-0.03	Composite S1 S2	10.4	17.5	4.418	-0.44	0.16	Composite S1 S2
C729	8.375	11.8	11.1	2.775	0.22	0.62	M2	15.2	14.2	4.418	0.47	0.9	M2
C730	8.631	11.9	12.9	2.775	0.71	1.03	M1	15.6	16.6	4.418	1.02	1.34	M1
C731	9.586	12	12.9	2.775	1.12	1.21	M1	16	16.9	4.418	1.45	1.54	M1
C732	-2.767	16.8	13.1	2.775	1.3	1.56	A2	21.1	17.2	4.418	1.65	1.92	A2
C733	10.976	13.1	17.2	2.775	1.59	1.67	M1	17.8	21.7	4.418	1.97	2.06	M1
C734	9.969	12	13.9	2.775	1.74	1.86	M1	16.7	18.7	4.418	2.14	2.25	M1
C735	0	15.3	13	2.775	1.95	2.13	H2	19.9	17.8	4.418	2.34	2.52	H2
C736	10.916	12	15.8	2.366	2.18	2.25	M1	16.8	20.7	3.846	2.58	2.65	M1
C737	4.418	14.1	12.7	2.366	2.31	2.57	M2	18.9	17.7	3.846	2.72	2.97	M2
C738	15.391	8.9	14.6	2.366	2.61	2.66	M1	13.7	19.5	3.846	3.02	3.06	M1
C739	14.455	9	10.6	2.315	2.8	2.84	M1	13.3	15.1	3.771	3.18	3.2	M1
C740	-10.308	18.2	10.6	2.315	2.97	3.16	A2	22.3	14.7	3.771	3.32	3.51	A2
C741	13.689	14.7	18.4	2.284	3.18	3.2	M1	19.1	22.7	3.726	3.54	3.56	M1
C742	2.371	15.7	15.1	2.284	3.23	3.3	M2	20.4	19.7	3.726	3.61	3.69	M2
C743	11.245	11.4	16.1	2.284	3.33	3.41	M1	16.2	20.9	3.726	3.73	3.81	M1
C744	10.94	9.8	12.2	2.284	3.48	3.65	M1	14.1	17.1	3.726	3.88	4	M1
C745	-4.58	14.2	11	2.263	3.75	3.93	A2	18.4	15.3	3.696	4.1	4.28	A2
C746	10.804	11.7	14.6	2.263	3.97	4.03	M1	16.2	19	3.696	4.33	4.4	M1
C747	10.804	10.9	12.5	2.263	4.09	4.15	M1	15.4	17	3.696	4.47	4.52	M1
C748	5.485	12.2	11.8	2.068	4.22	4.4	M2	16.5	16.3	3.356	4.6	4.76	M2
C750a	14.027	9.8	12.8	2.068	4.45	4.48	M1	14.1	17.2	3.356	4.81	4.84	M1
C751a	7.352	10.9	10.8	2.068	4.56	4.81	M2	14.6	15.1	3.356	4.92	5.13	M1
C752	6.706	11.5	11.6	2.068	4.88	5.03	M1	15.3	15.5	3.356	5.2	5.35	M1
C753	0	13.5	12.1	2.068	5.08	5.2	H2	17.5	16.1	3.356	5.41	5.53	H2
C754	9.558	11.7	13.9	2.068	5.23	5.3	M1	15.8	18.1	3.356	5.58	5.65	M1
C755	5.211	12.5	12.3	2.068	5.35	5.44	M2	16.7	16.5	3.356	5.71	5.79	M2

Table C-3
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SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Full Capacity (mgd)	Average Flow						Maximum Flow					
		Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C756	29.638	7	13	2.068	5.48	5.54	Composite S1 S2	9	17.3	3.356	5.85	5.7	Composite S1 S2
C757	-6.081	11.6	9.5	2.068	5.74	5.87	A2	14.5	12.3	3.356	5.97	6.11	A2
C758	-8.023	13	12.2	2.068	5.92	5.94	A2	16.2	15.4	3.356	6.18	6.21	A2
C759	-2.72	14.3	13.5	1.808	5.98	6.03	A2	17.9	16.9	2.903	6.27	6.33	A2
C759A	20.931	6.6	14.6	1.808	6.05	7.63	Composite S1 S2	8.4	18.3	2.903	6.37	7.78	Composite S1 S2
C760	20.931	6.1	8.9	1.576	7.82	8.59	Composite S1 S2	7.8	11.4	2.498	8.03	8.73	Composite S1 S2
C762	20.931	6.1	8.3	1.576	8.77	9.84	Composite S1 S2	7.8	10.5	2.498	8.96	9.97	Composite S1 S2
C764	16.149	6.3	8.2	1.576	10.48	10.95	M1	8	13.7	2.498	10.93	11.08	M1
C765	28.821	6.1	8.3	1.576	11.11	15.8	Composite S1 S2	7.8	10.5	2.498	11.3	15.94	Composite S1 S2
C768	1.325	11.7	8.3	1.576	15.98	16.27	M2	14.8	10.5	2.498	16.17	16.53	M2
C769	0.913	14.1	12	1.576	16.3	16.49	M2	17.9	15.2	2.498	16.57	16.81	M2
C770	1.912	14.6	14.4	1.576	16.52	16.58	M2	18.8	18.3	2.498	16.85	16.93	M2
C771	1.405	15.6	14.9	1.576	16.6	16.7	M2	20.3	19.2	2.498	16.96	17.09	M2
C772	1.199	16	15.8	1.334	16.72	16.78	M2	21.5	20.6	2.077	17.12	17.23	Composite M2PressureProfile
C773	1.299	16.3	16.2	1.334	16.79	16.84	M2	22.6	21.9	2.077	17.26	17.36	Pressure
C774	1.487	16.4	16.5	1.334	16.86	16.91	M1	23.6	22.9	2.077	17.39	17.51	Pressure
C775	1.151	16.8	16.6	1.334	16.93	16.98	M2	25	23.9	2.077	17.54	17.67	Pressure
C776	1.302	17	17	1.334	17	17.04	M2	26.1	25.4	2.077	17.69	17.8	Pressure
C777	1.827	16.8	17.2	1.334	17.06	17.09	M1	26.7	26.4	2.077	17.82	17.91	Pressure
C778	1.527	16.9	17	1.334	17.11	17.14	M1	27.4	27	2.077	17.94	18.02	Pressure
C779	1.136	17.3	17.1	1.334	17.16	17.21	M2	28.9	27.8	2.077	18.04	18.18	Pressure
C780	0.568	18.5	17.5	1.334	17.23	17.33	M2	32.2	29.2	2.077	18.2	18.47	Pressure
C781	0.858	18.9	18.6	1.334	17.34	17.39	M2	33.7	32.5	2.077	18.5	18.62	Pressure
C782	0.918	19.4	19.1	1.334	17.4	17.45	M2	35.5	34	2.077	18.64	18.8	Pressure
C783	1.87	19.3	19.5	1.334	17.47	17.48	M1	35.9	35.8	2.077	18.83	18.88	Pressure
C784	12.667	6.2	19.4	1.334	17.5	17.93	Composite S1 S2	18.4	36.3	2.077	18.9	18.94	Composite PressureProfileS1
C785	5.83	5.2	8.5	0.866	18.11	20.79	Composite S1 S2	6.5	18.7	1.343	18.97	20.9	Composite Pressure S1 S2
C786	5.605	5.2	7.1	0.866	20.95	22.16	Composite S1 S2	6.5	8.9	1.343	21.1	22.27	Composite S1 S2
C787	4.243	5.5	7.1	0.866	22.32	23.38	M1	7	8.9	1.343	22.47	23.5	M1
C788	4.443	5.4	7.1	0.866	23.51	24.75	M1	6.8	9	1.343	23.67	24.87	M1

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SewerCAD Model Pipe Information - Northeast Model

		Average Flow						Maximum Flow					
Pipe Label	Full Capacity (mgd)	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C789	2.407	7.5	7.1	0.866	24.89	25.36	M2	9.6	9	1.343	25.05	25.54	M2
C790	2.478	7.4	8.2	0.866	25.42	25.79	M1	9.6	10.4	1.343	25.61	25.98	M1
C791	7.973	5.2	8.1	0.866	25.85	26.44	Composite S1 S2	6.5	10.4	1.343	26.05	26.55	Composite S1 S2
C792	3.628	6	7.1	0.866	26.6	27.34	M1	7.6	8.9	1.343	26.75	27.47	M1
C40201	6.949	0	14.6	0	-3.49	1	Dry	0	19.6	0	-3.08	1	Dry
C40202	2.802	0	0	0	1	1.08	Dry	0	0	0	1	1.08	Dry
C52001	-2.079	14.8	13	1.485	2.29	2.38	A2	19	17	2.271	2.63	2.73	A2
C52002	-2.079	16.6	15.1	1.485	2.4	2.46	A2	21	19.3	2.271	2.75	2.83	A2
C52003	-2.079	17.4	16.7	1.485	2.48	2.5	A2	22.1	21.3	2.271	2.85	2.89	A2
C52004	14.002	6.3	17.6	1.485	2.51	6.02	Composite S1 S2	7.9	22.3	2.271	2.91	6.15	Composite S1 S2
C52005	14.002	6.3	8.6	1.485	6.21	10.15	Composite S1 S2	7.9	10.7	2.271	6.39	10.28	Composite S1 S2
C52006	14.002	6.3	8.6	1.485	10.34	10.52	Composite S1 S2	7.9	10.7	2.271	10.52	10.65	Composite S1 S2
C52007	2.205	7.8	8.6	1.485	10.71	12.4	Composite S1 S2	10.2	10.7	2.271	10.89	12.6	M1
C52008	2.205	7.7	11.2	1.455	12.69	12.76	Composite S1 S2	14.8	14.7	2.226	12.98	13.36	Pressure
C52009	2.205	7.7	11	1.455	13.04	14.55	Composite S1 S2	18.8	18.4	2.226	13.66	15.48	Pressure
C52010	2.292	7.7	11	1.455	14.83	15.64	Composite S1 S2	21.7	22.4	2.226	15.78	16.81	Pressure
C53401	0.451	8.8	8.4	0.548	8.39	8.46	M2	12.6	11.3	0.959	8.63	8.78	Composite M2PressureProfile
C53402	1.71	4.7	9.2	0.548	8.49	9.38	M1	6.4	13.3	0.959	8.84	9.53	Composite Pressure M1
CNSYPHON-1	472.858	9.5	60.7	4.017	-10.22	-8.61	Composite Pressure S1 S2	12.3	65.1	6.563	-9.86	-8.38	Composite Pressure S1 S2
CNSYPHON-2	63.453	60.6	85	4.017	-10.24	-10.23	Pressure	64.6	88.8	6.563	-9.92	-9.9	Pressure
CNSYPHON-3	-267.764	84.8	9.5	4.017	-10.53	-10.25	Composite A2PressureProfile	88.4	12.3	6.563	-10.3	-9.96	Composite A2PressureProfile
inlet- ridley	-14.724	7.9	7.7	1.576	10.45	10.45	A2	13.4	13.3	2.498	10.91	10.91	A2
Inlet 1	30.889	10.7	13	4.017	-8.32	-8.28	M1	14.7	16.9	6.563	-8	-7.95	M1
Inlet 2	0	12.9	12.9	4.017	-8.32	-8.32	H2	16.8	16.8	6.563	-8	-8	H2
Outlet	0	3.3	2.4	4.017	-11.12	-11.04	H2	4.4	3.4	6.563	-11.04	-10.96	H2
outlet- ridley	66.207	8.3	8.3	1.576	10.02	10.02	M1	10.5	10.5	2.498	10.2	10.2	M1
P-189	49.889	5.6	151.5	1.576	10.28	10.27	Composite Pressure S1 S2	12.2	157.6	2.498	10.79	10.82	Pressure

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SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Full Capacity (mgd)	Average Flow						Maximum Flow					
		Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
P-190	4.251	151.1	161.4	1.576	10.1	10.24	Pressure	156.5	164.4	2.498	10.35	10.69	Pressure
P-191	-51.283	161	8.3	1.576	10.02	10.06	Composite A2PressureProfile	163.2	10.5	2.498	10.21	10.25	Composite A2PressureProfile

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SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Future Average Flow						Future Maximum Flow					
	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C401	8.8	12	4.159	-14	-4.07	Composite S1 S2	12	12	7.56	-14	-3.81	Composite S1 S2
C402	13.8	11.9	4.159	-3.82	-3.56	M2	18.3	16.2	7.56	-3.46	-3.18	M2
C403	8.8	14.6	4.159	-3.49	-3.11	Composite S1 S2	12	19.6	7.56	-3.07	-2.85	Composite S1 S2
C404	6.9	11.9	1.572	-2.86	-2.3	M1	10.4	16.2	3.461	-2.5	-2.01	M1
C405	7.3	8.4	1.572	-2.18	-1.53	M1	11	12.7	3.461	-1.82	-1.22	M1
C406	9.4	8.6	1.572	-1.42	-1.06	M2	14.2	13	3.461	-1.05	-0.66	M2
C407	9.7	10.1	1.572	-1.01	-0.8	M1	15	15.3	3.461	-0.58	-0.36	M1
C408	10.1	10.3	1.388	-0.75	-0.73	M1	15.7	15.9	3.106	-0.29	-0.26	M1
C409	9.9	10.5	1.317	-0.69	-0.56	M1	15.7	16.3	2.976	-0.21	-0.07	M1
C410	6.5	10.3	1.317	-0.52	-0.38	M1	11.7	16.3	2.976	-0.02	0.05	M1
C411	6.4	7.8	1.317	-0.28	0.2	M1	9.7	12.9	2.976	0.15	0.48	M1
C412	6.4	7.7	1.317	0.31	0.97	M1	9.7	11.8	2.976	0.65	1.25	M1
C413	6.4	7.7	1.315	1.08	1.46	M1	9.7	11.8	2.97	1.42	1.74	M1
C414	5.7	7.7	1.315	1.57	1.87	M1	8.6	11.8	2.97	1.91	2.11	M1
C415	14.4	7.5	0.924	2.02	2.14	A2	19	11.5	2.247	2.35	2.52	A2
C416	19.1	14.5	0.924	2.15	2.16	A2	24.1	19.2	2.247	2.54	2.58	A2
C417	19.7	19.1	0.924	2.16	2.17	A2	24.8	24.2	2.247	2.59	2.59	A2
C418	17.8	19.8	0.924	2.17	2.18	M1	23.2	25	2.247	2.6	2.62	M1
C420	13.3	17.9	0.663	2.18	2.18	M1	18.9	23.3	1.765	2.63	2.65	M1
C421	4.2	13.3	0.663	2.19	2.61	M1	6.7	19	1.765	2.66	2.82	M1
C422	8.4	5.3	0.663	2.7	2.76	A2	12	8.8	1.765	2.99	3.06	A2
C501	7.5	11.9	2.587	-2.86	-2.29	Composite S1 S2	9.5	16.2	4.099	-2.5	-2.12	Composite S1 S2
C502	9.7	10.1	2.587	-2.07	-1.61	M1	12.4	12.9	4.099	-1.84	-1.39	M1
C503	11.4	11	2.587	-1.51	-1.35	M2	14.4	14	4.099	-1.25	-1.1	M2
C504	12.1	12.2	2.587	-1.28	-1.1	M1	15.5	15.5	4.099	-1.01	-0.82	M1
C505	13.5	12.8	2.587	-1.04	-1.03	A2	17.1	16.3	4.099	-0.75	-0.73	A2
C506	7.5	14	2.587	-0.98	-0.11	Composite S1 S2	9.5	17.7	4.099	-0.67	0.06	Composite S1 S2
C507	9.4	10.1	2.305	0.11	0.45	M1	12	12.9	3.673	0.34	0.67	M1
C508	9.3	10.5	2.305	0.54	0.55	M1	12.2	13.4	3.673	0.79	0.8	M1
C509	11.1	10.4	2.305	0.65	0.83	M2	14.1	13.6	3.673	0.91	1.09	M2
C509A	11.7	11.8	2.305	0.89	0.96	M1	15	15	3.673	1.16	1.24	M1
C510	11.9	12.3	2.301	1.01	1.15	M1	15.4	15.8	3.666	1.3	1.44	M1

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SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Future Average Flow						Future Maximum Flow					
	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C511	11.9	12.5	2.268	1.2	1.26	M1	15.5	16.1	3.609	1.5	1.56	M1
C512	11.2	12.5	2.268	1.31	1.32	M1	14.9	16.2	3.609	1.62	1.63	M1
C513	8	11.8	2.268	1.38	1.51	M1	11.2	15.7	3.609	1.7	1.77	M1
C514	11.9	9.7	2.263	1.65	1.81	A2	14.9	12.8	3.602	1.91	2.06	A2
C515	12.6	12.5	2.263	1.86	1.92	M2	15.9	15.7	3.602	2.13	2.19	M2
C515A	13.1	13.1	2.263	1.96	1.98	M1	16.5	16.5	3.602	2.25	2.27	M2
C516	13.4	13.5	2.263	2.02	2.05	M1	17.1	17.1	3.602	2.32	2.35	M1
C517	13.6	13.8	2.263	2.08	2.1	M1	17.3	17.6	3.602	2.4	2.42	M1
C518	13.4	13.8	2.175	2.13	2.16	M1	17.3	17.7	3.474	2.45	2.48	M1
C519	13.5	13.7	2.175	2.18	2.19	M1	17.4	17.6	3.474	2.5	2.52	M1
C520	13.4	13.7	2.175	2.22	2.24	M1	17.4	17.7	3.474	2.55	2.57	M1
C520A	12.8	13.7	2.175	2.26	2.27	M1	16.8	17.7	3.474	2.6	2.61	M1
C521	12	13	0.684	2.3	2.3	M1	16.1	17.1	1.184	2.64	2.64	M1
C522	3.5	12	0.684	2.3	2.29	Composite S1 S2	7.4	16.1	1.184	2.64	2.62	S1
C523	5.5	4.7	0.684	2.39	2.63	M2	7.5	7.9	1.184	2.65	2.79	M1
C524	4.5	6	0.684	2.67	3.3	M1	5.8	8	1.184	2.84	3.42	M1
C525	7	5.3	0.684	3.37	3.61	M2	9	7	1.184	3.51	3.78	M2
C526	7.3	7.2	0.684	3.63	3.68	M2	9.4	9.3	1.184	3.81	3.86	M2
C527	7.5	7.5	0.664	3.69	3.78	M2	9.8	9.7	1.154	3.88	3.97	M2
C528	7.7	7.7	0.664	3.79	3.82	M1	10	10.1	1.154	3.99	4.01	M1
C529	7.7	7.8	0.664	3.83	3.9	M1	10.2	10.3	1.154	4.03	4.11	M1
C530	3.7	7.9	0.604	3.92	3.97	M1	5.6	10.4	1.061	4.13	4.13	M1
C531	3.6	4.8	0.604	4.06	7.69	Composite S1 S2	4.8	6.6	1.061	4.21	7.79	Composite S1 S2
C532	7.6	4.8	0.594	7.79	8.2	M2	10	6.4	1.031	7.92	8.41	M2
C533	7.9	7.9	0.594	8.23	8.32	M2	10.6	10.4	1.031	8.44	8.55	M2
C534	8.1	8.2	0.594	8.35	8.37	M1	10.9	10.9	1.031	8.58	8.61	M2
C601	2.1	27.4	0.144	-6.17	-0.88	Composite Pressure S1 S2	4	32.7	0.483	-5.72	-0.73	Composite Pressure S1 S2
C602	2.8	2.9	0.144	-0.82	-0.47	M1	5.1	5.4	0.483	-0.61	-0.28	M1
C602A	2.6	3.1	0.144	-0.44	-0.09	M1	4.8	5.7	0.483	-0.23	0.09	M1
C603	2.2	3	0.144	-0.06	0.26	M1	4	5.5	0.483	0.15	0.41	M1
C604	2.5	2.8	0.126	0.31	1.17	M1	4.7	5.2	0.434	0.51	1.35	M1
C605	2.1	2.9	0.126	1.2	1.48	M1	3.9	5.3	0.434	1.4	1.63	M1

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Pipe Label	Future Average Flow						Future Maximum Flow					
	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C606	2.2	2.6	0.126	1.53	2.08	M1	4	5	0.434	1.72	2.23	M1
C607	2.4	2.7	0.126	2.12	2.8	M1	4.4	5	0.434	2.31	2.96	M1
C608	4.1	2.8	0.126	2.83	2.99	M2	7.2	5.1	0.434	3.03	3.25	M2
C609	5.2	4.2	0.105	3	3.03	A2	8.6	7.4	0.374	3.27	3.31	A2
C610	9.4	5.3	0.105	3.03	3.03	A2	12.9	8.7	0.374	3.32	3.32	A2
C611	1.9	9.4	0.105	3.03	3.36	M1	3.5	12.9	0.374	3.33	3.49	M1
C612	3.8	2.4	0.105	3.4	3.52	M2	6.5	4.6	0.374	3.58	3.75	M2
C613	1.7	3.8	0.1	3.53	3.95	Composite S1 S2	3.3	6.7	0.36	3.77	4.09	Composite S1 S2
C614	3.1	2.3	0.1	4	4.21	M2	5.8	4.5	0.36	4.18	4.43	M2
C615	4	3.2	0.1	4.22	4.32	M2	7.3	6	0.36	4.45	4.59	M2
C701	9.9	12	4.415	-8.18	-8	Composite S1 S2	13.2	17.2	7.766	-7.74	-7.72	Composite S1 S2
C702	9.9	13.4	4.415	-7.7	-6.6	Composite S1 S2	13.2	18.1	7.766	-7.31	-6.32	Composite S1 S2
C703	27.1	13.4	4.415	-6.3	-6.19	A2	32.1	18.1	7.766	-5.91	-5.77	A2
C704	22.6	27.4	4.271	-6.17	-6.11	M1	28.7	32.7	7.284	-5.72	-5.6	M1
C705	21.5	23	4.271	-6.08	-6.07	M1	27.9	29.3	7.284	-5.55	-5.54	M1
C706	14.8	21.9	4.246	-6.04	-5.92	M1	21.7	28.6	7.243	-5.48	-5.35	M1
C707	16.9	15.9	4.246	-5.84	-5.78	A2	23.8	22.9	7.243	-5.25	-5.2	A2
C708	16.6	17.7	4.059	-5.72	-5.6	M1	23.7	24.8	6.946	-5.12	-5.01	M1
C709	16.1	17.3	4.059	-5.54	-5.5	M1	23.3	24.6	6.946	-4.93	-4.9	M1
C710	12.4	16.9	4.059	-5.44	-5	M1	18.2	24.2	6.946	-4.83	-4.52	M1
C711	12.5	14	4.059	-4.87	-4.56	M1	17.6	19.9	6.946	-4.38	-4.13	M1
C712	14.5	14	4.059	-4.43	-4.1	M2	19.8	19.4	6.946	-3.98	-3.66	M2
C713	20.1	15.5	4.059	-4.02	-3.8	A2	25.9	21.1	6.946	-3.55	-3.31	A2
C714	18.5	20.5	4.059	-3.76	-3.69	M1	25	26.7	6.946	-3.25	-3.16	M1
C715	17	19.1	4.059	-3.65	-3.54	M1	23.8	25.7	6.946	-3.09	-2.97	M1
C716	16.8	17.7	4.059	-3.48	-3.33	M1	23.8	24.7	6.946	-2.89	-2.74	M1
C717	15.8	17.5	4.059	-3.27	-3.11	M1	22.9	24.7	6.946	-2.67	-2.52	M1
C718	15.9	16.6	3.722	-3.04	-2.99	M1	23	23.9	6.417	-2.44	-2.39	M1
C719	13.8	16.6	3.722	-2.93	-2.75	M1	20.7	23.8	6.417	-2.32	-2.18	M1
C720	11	14.8	3.722	-2.66	-2.72	S1	18.3	21.7	6.417	-2.09	-2.11	S1
C721	11.9	12.8	3.722	-2.57	-2.05	M1	17	19.7	6.417	-2	-1.62	M1
C722	20.2	13.8	3.722	-1.89	-1.78	A2	25.8	19.2	6.417	-1.44	-1.31	A2

Table C-3
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Future Average Flow						Future Maximum Flow					
	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C723	19.7	20.7	3.453	-1.74	-1.68	M1	26.2	26.7	6.027	-1.24	-1.13	M1
C724	18.6	20.2	3.442	-1.64	-1.58	M1	25.9	27	6.011	-1.07	-0.97	M1
C725	14.5	19.1	3.442	-1.54	-1.45	M1	22.4	26.7	6.011	-0.9	-0.79	M1
C726	9.8	15.5	3.442	-1.37	-1.11	M1	15.9	23.5	6.011	-0.7	-0.59	M1
C727	13.3	12.5	3.442	-0.88	-0.79	M2	18.9	18.2	6.011	-0.4	-0.33	M2
C728	8.8	14.5	3.173	-0.69	0.02	Composite S1 S2	11.8	20.4	5.621	-0.2	0.27	Composite S1 S2
C729	12.7	11.9	3.173	0.28	0.69	M2	17.4	16.2	5.621	0.64	1.09	M2
C730	12.8	13.8	3.173	0.79	1.11	M1	18.2	19	5.621	1.23	1.56	M1
C731	13	14	3.173	1.2	1.3	M1	18.8	19.6	5.621	1.68	1.77	M1
C732	17.8	14.1	3.173	1.39	1.65	A2	24.2	20.1	5.621	1.89	2.18	A2
C733	14.2	18.3	3.173	1.69	1.77	M1	21.2	25	5.621	2.24	2.35	M1
C734	13.1	15.1	3.173	1.84	1.96	M1	20.2	22.2	5.621	2.43	2.54	M1
C735	16.4	14.2	3.173	2.04	2.23	H2	23.5	21.3	5.621	2.63	2.82	H2
C736	13.2	17	2.764	2.28	2.35	M1	20.6	24.3	5.049	2.88	2.97	M1
C737	15.3	14	2.764	2.42	2.68	M2	22.7	21.5	5.049	3.04	3.29	M2
C738	10.1	15.9	2.764	2.72	2.76	M1	17.7	23.4	5.049	3.35	3.39	M1
C739	10.1	11.7	2.713	2.9	2.93	M1	17.2	18.9	4.974	3.5	3.52	M1
C740	19.3	11.7	2.713	3.06	3.26	A2	25.9	18.5	4.974	3.63	3.81	A2
C741	15.9	19.6	2.682	3.28	3.3	M1	23	26.5	4.929	3.85	3.88	M1
C742	17	16.4	2.682	3.34	3.41	M2	24.5	23.6	4.929	3.94	4.03	M2
C743	12.7	17.4	2.682	3.44	3.52	M1	20.5	25.1	4.929	4.08	4.17	M1
C744	10.9	13.5	2.682	3.59	3.74	M1	18.1	21.3	4.929	4.24	4.34	M1
C745	14.8	12.2	2.263	3.84	3.98	A2	21.3	19.2	3.696	4.43	4.52	A2
C746	12.2	15.2	2.263	4.01	4.07	M1	18.7	21.7	3.696	4.56	4.6	M1
C747	11.2	12.9	2.263	4.12	4.17	M1	17.4	19.2	3.696	4.65	4.69	M1
C748	12.4	12	2.068	4.24	4.41	M2	17.8	18.1	3.356	4.75	4.86	M1
C750a	9.9	12.9	2.068	4.45	4.48	M1	15.2	18.3	3.356	4.91	4.93	M1
C751a	10.9	10.8	2.068	4.56	4.82	M2	15.1	16	3.356	5	5.17	M1
C752	11.5	11.6	2.068	4.88	5.03	M1	15.6	16	3.356	5.24	5.37	M1
C753	13.5	12.2	2.068	5.08	5.2	H2	17.7	16.4	3.356	5.43	5.55	H2
C754	11.6	13.9	2.068	5.23	5.3	M1	16	18.3	3.356	5.59	5.66	M1
C755	12.5	12.2	2.068	5.35	5.44	M2	16.8	16.7	3.356	5.72	5.8	M2

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SewerCAD Model Pipe Information - Northeast Model

Pipe Label	Future Average Flow						Future Maximum Flow					
	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C756	7	13	2.068	5.48	5.54	Composite S1 S2	9	17.4	3.356	5.85	5.7	Composite S1 S2
C757	11.6	9.5	2.068	5.74	5.87	A2	14.5	12.3	3.356	5.97	6.11	A2
C758	13	12.2	2.068	5.92	5.94	A2	16.2	15.4	3.356	6.18	6.21	A2
C759	14.3	13.5	1.808	5.98	6.03	A2	17.9	16.9	2.903	6.27	6.33	A2
C759A	6.6	14.6	1.808	6.05	7.63	Composite S1 S2	8.4	18.3	2.903	6.37	7.78	Composite S1 S2
C760	6.1	8.9	1.576	7.82	8.59	Composite S1 S2	7.8	11.4	2.498	8.03	8.73	Composite S1 S2
C762	6.1	8.3	1.576	8.77	9.84	Composite S1 S2	7.8	10.5	2.498	8.96	9.97	Composite S1 S2
C764	6.3	8.2	1.576	10.48	10.95	M1	8	13.7	2.498	10.93	11.08	M1
C765	6.1	8.3	1.576	11.11	15.8	Composite S1 S2	7.8	10.5	2.498	11.3	15.94	Composite S1 S2
C768	11.7	8.3	1.576	15.98	16.27	M2	14.8	10.5	2.498	16.17	16.53	M2
C769	14.1	12	1.576	16.3	16.49	M2	17.9	15.2	2.498	16.57	16.81	M2
C770	14.6	14.4	1.576	16.52	16.58	M2	18.8	18.3	2.498	16.85	16.93	M2
C771	15.6	14.9	1.576	16.6	16.7	M2	20.3	19.2	2.498	16.96	17.09	M2
C772	16	15.8	1.334	16.72	16.78	M2	21.5	20.6	2.077	17.12	17.23	Composite M2PressureProfile
C773	16.3	16.2	1.334	16.79	16.84	M2	22.6	21.9	2.077	17.26	17.36	Pressure
C774	16.4	16.5	1.334	16.86	16.91	M1	23.6	22.9	2.077	17.39	17.51	Pressure
C775	16.8	16.6	1.334	16.93	16.98	M2	25	23.9	2.077	17.54	17.67	Pressure
C776	17	17	1.334	17	17.04	M2	26.1	25.4	2.077	17.69	17.8	Pressure
C777	16.8	17.2	1.334	17.06	17.09	M1	26.7	26.4	2.077	17.82	17.91	Pressure
C778	16.9	17	1.334	17.11	17.14	M1	27.4	27	2.077	17.94	18.02	Pressure
C779	17.3	17.1	1.334	17.16	17.21	M2	28.9	27.8	2.077	18.04	18.18	Pressure
C780	18.5	17.5	1.334	17.23	17.33	M2	32.2	29.2	2.077	18.2	18.47	Pressure
C781	18.9	18.6	1.334	17.34	17.39	M2	33.7	32.5	2.077	18.5	18.62	Pressure
C782	19.4	19.1	1.334	17.4	17.45	M2	35.5	34	2.077	18.64	18.8	Pressure
C783	19.3	19.5	1.334	17.47	17.48	M1	35.9	35.8	2.077	18.83	18.88	Pressure
C784	6.2	19.4	1.334	17.5	17.93	Composite S1 S2	18.4	36.3	2.077	18.9	18.94	Composite PressureProfileS1
C785	5.2	8.5	0.866	18.11	20.79	Composite S1 S2	6.5	18.7	1.343	18.97	20.9	Composite Pressure S1 S2
C786	5.2	7.1	0.866	20.95	22.16	Composite S1 S2	6.5	8.9	1.343	21.1	22.27	Composite S1 S2
C787	5.5	7.1	0.866	22.32	23.38	M1	7	8.9	1.343	22.47	23.5	M1
C788	5.4	7.1	0.866	23.51	24.75	M1	6.8	9	1.343	23.67	24.87	M1

Table C-3
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Northeast Model

	Future Average Flow						Future Maximum Flow					
Pipe Label	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C789	7.5	7.1	0.866	24.89	25.36	M2	9.6	9	1.343	25.05	25.54	M2
C790	7.4	8.2	0.866	25.42	25.79	M1	9.6	10.4	1.343	25.61	25.98	M1
C791	5.2	8.1	0.866	25.85	26.44	Composite S1 S2	6.5	10.4	1.343	26.05	26.55	Composite S1 S2
C792	6	7.1	0.866	26.6	27.34	M1	7.6	8.9	1.343	26.75	27.47	M1
C40201	0	14.6	0	-3.49	1	Dry	0	19.6	0	-3.07	1	Dry
C40202	0	0	0	1	1.08	Dry	0	0	0	1	1.08	Dry
C52001	14.9	13	1.491	2.3	2.39	A2	19.1	17.1	2.29	2.64	2.74	A2
C52002	16.6	15.1	1.491	2.41	2.47	A2	21.2	19.4	2.29	2.77	2.84	A2
C52003	17.4	16.8	1.491	2.48	2.5	A2	22.2	21.4	2.29	2.87	2.9	A2
C52004	6.3	17.6	1.491	2.52	6.02	Composite S1 S2	7.9	22.5	2.29	2.92	6.16	Composite S1 S2
C52005	6.3	8.6	1.491	6.21	10.15	Composite S1 S2	7.9	10.8	2.29	6.4	10.28	Composite S1 S2
C52006	6.3	8.6	1.491	10.34	10.52	Composite S1 S2	7.9	10.8	2.29	10.52	10.65	Composite S1 S2
C52007	7.8	8.6	1.491	10.71	12.4	Composite S1 S2	10.3	10.8	2.29	10.89	12.61	M1
C52008	7.7	11.2	1.461	12.69	12.76	Composite S1 S2	15	14.9	2.245	12.99	13.37	Pressure
C52009	7.7	11.1	1.461	13.04	14.55	Composite S1 S2	19.4	18.7	2.245	13.68	15.53	Pressure
C52010	7.7	11.1	1.461	14.83	15.64	Composite S1 S2	22.6	23.1	2.245	15.83	16.88	Pressure
C53401	8.8	8.4	0.548	8.39	8.46	M2	12.6	11.3	0.959	8.63	8.78	Composite M2PressureProfile
C53402	4.7	9.2	0.548	8.49	9.38	M1	6.4	13.3	0.959	8.84	9.53	Composite Pressure M1
CNSYPHON-1	10	61.5	4.415	-10.16	-8.57	Composite Pressure S1 S2	13.4	67	7.766	-9.7	-8.28	Composite Pressure S1 S2
CNSYPHON-2	61.3	85.6	4.415	-10.19	-10.18	Pressure	66.3	90.4	7.766	-9.78	-9.75	Pressure
CNSYPHON-3	85.4	10	4.415	-10.49	-10.2	Composite A2PressureProfile	89.8	13.4	7.766	-10.2	-9.84	Composite A2PressureProfile
inlet- ridley	7.9	7.7	1.576	10.45	10.45	A2	13.4	13.3	2.498	10.91	10.91	A2
Inlet 1	11.4	13.6	4.415	-8.26	-8.23	M1	16.3	18.5	7.766	-7.86	-7.81	M1
Inlet 2	13.6	13.6	4.415	-8.27	-8.27	H2	18.4	18.4	7.766	-7.87	-7.87	H2
Outlet	3.5	2.6	4.415	-11.1	-11.03	H2	4.8	3.8	7.766	-11.01	-10.92	H2
outlet- ridley	8.3	8.3	1.576	10.02	10.02	M1	10.5	10.5	2.498	10.2	10.2	M1
P-189	5.6	151.5	1.576	10.28	10.27	Composite Pressure S1 S2	12.2	157.6	2.498	10.79	10.82	Pressure

Table C-3
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Northeast Model

	Future Average Flow						Future Maximum Flow					
Pipe Label	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
P-190	151.1	161.4	1.576	10.1	10.24	Pressure	156.5	164.4	2.498	10.35	10.69	Pressure
P-191	161	8.3	1.576	10.02	10.06	Composite A2PressureProfile	163.2	10.5	2.498	10.21	10.25	Composite A2PressureProfile

Table C-4
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C101	Delaware River Interceptor	EPS-1 WW	01-001	13.5	-2.48	-5.48	12	-3.79	-6.79	-0.131	10	36 inch	0.013
C102	Delaware River Interceptor	01-001	01-002	12	-2.46	-5.46	12.85	-2.38	-5.38	0.000833	96	36 inch	0.013
C103	Delaware River Interceptor	01-002	01-003	12.85	-3.38	-5.38	12.85	-3.07	-5.07	0.008611	36	24 inch	0.013
C104	Delaware River Interceptor	01-003	01-004	12.85	-3.07	-5.07	14.87	-2.07	-4.07	0.0025	400	24 inch	0.013
C105	Delaware River Interceptor	01-004	01-005	14.87	-2.07	-4.07	13.81	-1.99	-3.99	0.000237	337	24 inch	0.013
C106	Delaware River Interceptor	01-005	01-006	13.81	-1.99	-3.99	14	-1.7	-3.7	0.000801	362	24 inch	0.013
C107	Delaware River Interceptor	01-006	01-007	14	-1.7	-3.7	16.11	-1.4	-3.4	0.00082	366	24 inch	0.013
C108	Delaware River Interceptor	01-007	01-008	16.11	-1.4	-3.4	17.84	-1.52	-3.52	-0.000324	370	24 inch	0.013
C109	Delaware River Interceptor	01-008	01-009	17.84	-1.52	-3.52	18.99	-1.53	-3.53	-0.00012	83.25	24 inch	0.013
C110	Delaware River Interceptor	01-009	01-010	18.99	-1.53	-3.53	18.2	-0.65	-2.65	0.0038	231.58	24 inch	0.013
C111	Delaware River Interceptor	01-010	01-011	18.2	-0.65	-2.65	19.13	-0.11	-2.11	0.00144	374.92	24 inch	0.013
C112	Delaware River Interceptor	01-011	01-012	19.13	-0.11	-2.11	17.66	-0.19	-2.19	-0.000212	378.25	24 inch	0.013
C113	Delaware River Interceptor	01-012	01-013	17.66	-0.19	-2.19	15.26	0.36	-1.64	0.001583	347.5	24 inch	0.013
C114	Delaware River Interceptor	01-013	01-014	15.26	0.36	-1.64	15.73	0.63	-1.37	0.000777	347.42	24 inch	0.013
C115	Delaware River Interceptor	01-014	01-015	15.73	0.63	-1.37	15.34	0.64	-1.36	0.000313	32	24 inch	0.013
C116	Delaware River Interceptor	01-015	01-016	15.34	0.64	-1.36	16.27	0.77	-1.23	0.000368	353	24 inch	0.013
C117	Delaware River Interceptor	01-016	01-017	16.27	0.77	-1.23	15.03	0.86	-1.14	0.001755	49	24 inch	0.013
C118	Delaware River Interceptor	01-017	01-018	15.03	0.86	-1.14	12.26	1.36	-0.64	0.001755	287.25	24 inch	0.013
C119	Delaware River Interceptor	01-018	01-019	12.26	1.36	-0.64	13.93	1.83	-0.17	0.001323	355.33	24 inch	0.013
C120	Delaware River Interceptor	01-019	01-020	13.93	1.83	-0.17	14.44	1.94	-0.06	0.002075	53	24 inch	0.013
C121	Delaware River Interceptor	01-020	01-021	14.44	1.44	-0.06	15.35	1.85	0.35	0.001268	323.42	18 inch	0.013
C122	Delaware River Interceptor	01-021	01-022	15.35	1.85	0.35	13.81	2.51	1.01	0.001789	368.92	18 inch	0.013
C123	Delaware River Interceptor	01-022	01-023	13.81	2.51	1.01	11.75	2.9	1.4	0.001134	344	18 inch	0.013
C124	Delaware River Interceptor	01-023	01-024	11.75	2.9	1.4	11.32	3.12	1.62	0.010476	21	18 inch	0.013
C201	West End Interceptor	01-004	02-001	14.87	0.43	-4.07	14.84	11.84	7.34	0.877692	13	54 inch	0.013
C202	West End Interceptor	02-001	02-002	14.84	11.84	7.34	18.87	12.02	7.52	0.000571	315	54 inch	0.013
C203	West End Interceptor	02-002	02-003	18.87	12.02	7.52	18.7	12.47	7.97	0.004091	110	54 inch	0.013
C204	West End Interceptor	02-003	02-004	18.7	12.47	7.97	24.92	12.47	7.97	0	280	54 inch	0.013
C205	West End Interceptor	02-004	02-005	24.92	12.47	7.97	19.99	12.74	8.24	0.000774	348.75	54 inch	0.013
C206	West End Interceptor	02-005	02-006	19.99	12.74	8.24	23.96	13.11	8.61	0.00193	191.67	54 inch	0.013
C207	West End Interceptor	02-006	02-007	23.96	13.11	8.61	22.16	13.21	8.71	0.00028	357	54 inch	0.013
C208	West End Interceptor	02-007	02-008	22.16	13.21	8.71	22.19	13.34	8.84	0.007222	18	54 inch	0.013

Table C-4
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C301	West End Interceptor	02-008	03-001	22.19	13.34	8.84	20.73	13.73	9.23	0.002241	174	54 inch	0.013
C302	West End Interceptor	03-001	03-002	20.73	13.73	9.23	22.35	13.95	9.45	0.000669	328.67	54 inch	0.013
C303	West End Interceptor	03-002	03-003	22.35	13.95	9.45	22.6	13.7	9.2	-0.010417	24	54 inch	0.013
C304	West End Interceptor	03-003	03-004	22.6	13.7	9.2	22.37	13.77	9.27	0.002692	26	54 inch	0.013
C306	West End Interceptor	03-004	03-006	22.37	13.77	9.27	17.5	14.1	9.6	0.001013	325	54 inch	0.013
C307	West End Interceptor	03-006	03-007	17.5	14.1	9.6	24.46	14.46	9.96	0.001013	356.25	54 inch	0.013
C308	West End Interceptor	03-007	03-008	24.46	14.46	9.96	27.6	14.5	10	0.000274	146	54 inch	0.013
C309	West End Interceptor	03-008	03-009	27.6	14.5	10	29.22	14.67	10.17	0.000929	183	54 inch	0.013
C310	West End Interceptor	03-009	03-010	29.22	14.67	10.17	24.23	15.13	10.63	0.001277	360.25	54 inch	0.013
C311	West End Interceptor	03-010	03-011	24.23	15.13	10.63	28.71	15.51	11.01	0.001054	360.58	54 inch	0.013
C312	West End Interceptor	03-011	03-012	28.71	15.51	11.01	30.4	15.84	11.34	0.00089	370.83	54 inch	0.013
C313	West End Interceptor	03-012	03-013	30.4	15.84	11.34	31.23	15.98	11.48	0.000815	171.75	54 inch	0.013
C314	West End Interceptor	03-013	03-014	31.23	15.98	11.48	27.38	16.33	11.83	0.001014	345	54 inch	0.013
C315	West End Interceptor	03-014	03-015	27.38	16.33	11.83	25.15	17	12.5	0.00096	698	54 inch	0.013
C316	West End Interceptor	03-015	03-016	25.15	17	12.5	27.09	17.34	12.84	0.000942	361	54 inch	0.013
C317	West End Interceptor	03-016	03-017	27.09	17.34	12.84	28.89	17.54	13.04	0.000547	365.33	54 inch	0.013
C318	West End Interceptor	03-017	03-018	28.89	17.04	13.04	30.49	17.49	13.49	0.001243	362.17	48 inch	0.013
C319	West End Interceptor	03-018	03-019	30.49	17.49	13.49	35.47	17.77	13.77	0.000757	370	48 inch	0.013
C321	West End Interceptor	03-019	03-021	35.47	17.77	13.77	30.26	17.96	13.96	0.000535	355.17	48 inch	0.013
C322	West End Interceptor	03-021	03-022	30.26	17.96	13.96	21.7	18.1	14.1	0.000382	366.33	48 inch	0.013
C323	West End Interceptor	03-022	03-023	21.7	18.1	14.1	21.63	18.73	14.73	0.001848	341	48 inch	0.013
C324	West End Interceptor	03-023	03-024	21.63	18.73	14.73	21.68	19.18	15.18	0.011321	39.75	48 inch	0.013
C325	West End Interceptor	03-024	03-025	21.68	19.18	15.18	28.68	19.08	15.08	-0.000289	346.58	48 inch	0.013
C326	West End Interceptor	03-025	03-026	28.68	19.08	15.08	28.72	19.11	15.11	0.000792	40	48 inch	0.013
C327	West End Interceptor	03-026	03-027	28.72	19.11	15.11	32.6	19.4	15.4	0.000792	364	48 inch	0.013
C328	West End Interceptor	03-027	03-028	32.6	19.4	15.4	28.4	19.85	15.85	0.002111	213.17	48 inch	0.013
C329	West End Interceptor	03-028	03-029	28.4	19.85	15.85	31.34	20.39	16.39	0.002775	194.58	48 inch	0.013
C330	West End Interceptor	03-029	03-030	31.34	20.39	16.39	32.48	20.68	16.68	0.002	145	48 inch	0.013
C331	West End Interceptor	03-030	03-031	32.48	20.68	16.68	30.38	20.98	16.98	0.001228	244.33	48 inch	0.013
C332	West End Interceptor	03-031	03-032	30.38	20.98	16.98	31.2	22.1	18.1	0.021401	52.33	48 inch	0.013
C333	West End Interceptor	03-032	03-033	31.2	22.1	18.1	31.57	21.47	17.47	-0.002215	284.42	48 inch	0.013
C334	West End Interceptor	03-033	03-034	31.57	21.47	17.47	26.88	21.98	17.98	0.001463	348.67	48 inch	0.013

Table C-4
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SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C335	West End Interceptor	03-034	03-035	26.88	19.31	17.98	28.1	22.73	21.4	0.097714	35	16 inch	0.011
C336	West End Interceptor	03-035	03-036	28.1	22.73	21.4	39.73	22.93	21.6	0.000653	306.08	16 inch	0.011
C20701	Booth Street Interceptor	02-007	02-007-001	22.16	10.21	8.71	24.3	14.9	13.4	0.014807	316.75	18 inch	0.013
C20702	Booth Street Interceptor	02-007-001	02-007-002	24.3	14.9	13.4	26.31	17.86	16.36	0.009933	298	18 inch	0.013
C20703	Booth Street Interceptor	02-007-002	02-007-003	26.31	17.86	16.36	27.72	20.32	18.82	0.008434	291.67	18 inch	0.013
C20704	Booth Street Interceptor	02-007-003	02-007-004	27.72	20.32	18.82	34.09	31.27	29.77	0.044694	245	18 inch	0.013
C20705	Booth Street Interceptor	02-007-004	02-007-005	34.09	31.27	29.77	37.4	31	29.5	-0.002015	134	18 inch	0.013
C20706	Booth Street Interceptor	02-007-005	02-007-006	37.4	31	29.5	43.08	37.38	35.88	0.021361	298.67	18 inch	0.013
C20707	Booth Street Interceptor	02-007-006	02-007-007	43.08	37.38	35.88	47.9	40.4	38.9	0.019024	158.75	18 inch	0.013
C20708	Booth Street Interceptor	02-007-007	02-007-008	47.9	40.4	38.9	53.07	43.84	42.34	0.026667	129	18 inch	0.013
C20709	Booth Street Interceptor	02-007-008	02-007-009	53.07	43.84	42.34	55.02	46.47	44.97	0.024851	105.83	18 inch	0.013
C20710	Booth Street Interceptor	02-007-009	02-007-010	55.02	46.47	44.97	58.73	50.63	49.13	0.028267	147.17	18 inch	0.013
C20711	Booth Street Interceptor	02-007-010	02-007-011	58.73	50.63	49.13	59.36	50.91	49.41	0.013884	20.17	18 inch	0.013
C20712	Booth Street Interceptor	02-007-011	02-007-012	59.36	50.91	49.41	65.4	55.4	53.9	0.020112	223.25	18 inch	0.013
C20713	Booth Street Interceptor	02-007-012	02-007-013	65.4	55.4	53.9	66.16	55.96	54.46	0.024173	23.17	18 inch	0.013
C20714	Booth Street Interceptor	02-007-013	02-007-014	66.16	55.96	54.46	69.62	58.12	56.62	0.014694	147	18 inch	0.013
C20715	Booth Street Interceptor	02-007-014	02-007-015	69.62	58.12	56.62	71	58.8	57.3	0.004444	153	18 inch	0.013
C20716	Booth Street Interceptor	02-007-015	02-007-016	71	58.8	57.3	75.66	59.1	57.6	0.00087	345	18 inch	0.011
C20717	Booth Street Interceptor	02-007-016	02-007-017	75.66	59.1	57.6	75.4	61.94	60.44	0.016198	175.33	18 inch	0.011
C20718	Booth Street Interceptor	02-007-017	02-007-018	75.4	61.94	60.44	75.5	61.8	60.3	-0.000428	327.42	18 inch	0.011
C20719	Booth Street Interceptor	02-007-018	02-007-019	75.5	61.8	60.3	68.47	61.87	60.37	0.00023	305	18 inch	0.013
C20720	Booth Street Interceptor	02-007-019	02-007-020	68.47	61.87	60.37	66.14	64.04	62.54	0.011327	191.58	18 inch	0.013
C20721	Booth Street Interceptor	02-007-020	02-007-021	66.14	64.04	62.54	66.53	64.73	63.23	0.005433	127	18 inch	0.013
C20722	Booth Street Interceptor	02-007-021	02-007-022	66.53	64.73	63.23	69.81	64.73	63.23	0	214	18 inch	0.013
C20723	Booth Street Interceptor	02-007-022	02-007-023	69.81	64.48	63.23	75.67	65.07	63.82	0.00281	210	15 inch	0.013
C20724	Booth Street Interceptor	02-007-023	02-007-024	75.67	65.07	63.82	75.67	65.86	64.61	0.002801	282	15 inch	0.013
C20725	Booth Street Interceptor	02-007-024	02-007-025	75.67	65.86	64.61	76.44	65.98	64.73	0.003	40	15 inch	0.013
C20726	Booth Street Interceptor	02-007-025	02-007-026	76.44	65.98	64.73	71.88	66.93	65.68	0.002798	339.5	15 inch	0.013
C20727	Booth Street Interceptor	02-007-026	02-007-027	71.88	66.93	65.68	83.96	68.46	67.21	0.004752	322	15 inch	0.013
C20728	Booth Street Interceptor	02-007-027	02-007-028	83.96	68.46	67.21	79.38	70.33	69.08	0.006727	278	15 inch	0.013
C2072702	Booth Street Interceptor	02-007-028	02-007-027-002	79.38	69.91	69.08	85.37	71.9	71.07	0.006525	305	10 inch	0.013
C2072703	Booth Street Interceptor	02-007-027-00	02-007-027-003	85.37	72.07	71.07	84.25	73.2	72.2	0.009883	114.33	12 inch	0.011

Table C-4
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SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Description	Downstream Node	Upstream Node	Down-stream Ground Elev. (ft)	Down-stream Crown Elev. (ft)	Down-stream Invert Elev. (ft)	Up-stream Ground Elev. (ft)	Up-stream Crown Elev. (ft)	Up-stream Invert Elev. (ft)	Slope (ft/ft)	Length (ft)	Diameter	Mannings n
C2072704	Booth Street Interceptor	02-007-027-00	02-007-027-004	84.25	73.2	72.2	85.73	74.93	73.93	0.006285	275.25	12 inch	0.011
C2072705	Booth Street Interceptor	02-007-027-00	02-007-027-005	85.73	74.6	73.93	95.71	87.88	87.21	0.043804	303.17	8 inch	0.011
C2072706	Booth Street Interceptor	02-007-027-00	02-007-027-006	95.71	87.88	87.21	99.61	90.58	89.91	0.008316	324.67	8 inch	0.011

Table C-4
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

		Average Flow						Maximum Flow					
Pipe Label	Full Capacity (mgd)	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C101	-156.017	25.2	7	2.288	-4.89	-4.69	A2	29.3	10.1	4.662	-4.63	-4.35	A2
C102	12.444	9.9	9.3	2.288	-4.68	-4.56	M2	14.2	13.6	4.662	-4.33	-4.2	M2
C103	13.567	7.9	10.8	2.288	-4.48	-4.41	Composite S1 S2	11.4	15.6	4.662	-4.08	-4.12	Composite S1 S2
C104	7.31	9.2	10.8	2.288	-4.17	-3.3	M1	13.9	15.9	4.662	-3.75	-2.91	M1
C105	2.253	11.2	11.1	1.056	-3.14	-3.05	M2	17.8	16.6	2.828	-2.68	-2.51	M2
C106	4.138	9.4	11.5	1.056	-3.03	-2.92	M1	16.9	18.4	2.828	-2.46	-2.3	M1
C107	4.186	8.6	9.8	1.056	-2.88	-2.69	M1	16.1	17.5	2.828	-2.24	-2.05	M1
C108	-2.633	12.3	9.1	1.056	-2.65	-2.49	A2	20.4	16.9	2.828	-2	-1.82	A2
C109	-1.602	12.8	12.5	1.056	-2.48	-2.46	A2	21.3	20.8	2.828	-1.79	-1.76	A2
C110	9.013	5.5	13	1.056	-2.45	-2.19	M1	12	21.7	2.828	-1.72	-1.65	M1
C111	5.549	6.5	7.2	0.897	-2.05	-1.57	M1	11.3	13.4	2.398	-1.53	-1.17	M1
C112	-2.126	10.8	7.3	0.835	-1.5	-1.29	A2	16.3	12.5	2.231	-1.07	-0.83	A2
C113	5.817	6.4	10.9	0.835	-1.28	-1.11	M1	12	16.7	2.231	-0.8	-0.64	M1
C114	4.076	7.3	7.1	0.835	-1.05	-0.76	M2	12.8	12.9	2.231	-0.56	-0.31	M1
C115	2.585	7.9	7.8	0.835	-0.72	-0.7	M2	13.7	13.5	2.231	-0.24	-0.22	M2
C116	2.806	8.7	8.3	0.835	-0.67	-0.51	M2	14.9	14.3	2.231	-0.17	0.01	M2
C117	6.124	8.1	9	0.835	-0.48	-0.47	M1	14.6	15.4	2.231	0.06	0.07	M1
C118	6.124	3	8.5	0.155	-0.44	-0.39	M1	9.2	15.2	0.423	0.12	0.13	M1
C119	5.317	2.8	3.2	0.155	-0.37	0.06	M1	4.9	9.3	0.423	0.13	0.24	M1
C120	6.661	2.6	3.1	0.155	0.09	0.15	M1	4.5	5.3	0.423	0.27	0.31	M1
C121	2.417	3.1	2.9	0.155	0.18	0.61	M2	5.1	5	0.423	0.35	0.77	M2
C122	2.871	2.3	3.4	0.104	0.63	1.21	M1	3.8	5.6	0.287	0.81	1.33	M1
C123	2.286	2.6	2.6	0.104	1.23	1.62	M2	4.3	4.3	0.287	1.37	1.76	M1
C124	6.949	1.8	2.8	0.104	1.63	1.77	Composite S1 S2	3	4.7	0.287	1.79	1.87	Composite S1 S2
C201	1,190.65	4.6	11.1	1.232	-3.14	7.72	Composite S1 S2	5.6	16.6	1.834	-2.68	7.81	Composite S1 S2
C202	30.38	7.2	6.2	1.232	7.86	8.12	M2	8.7	7.6	1.834	7.97	8.25	M2
C203	81.288	4.6	7.7	1.232	8.16	8.36	M1	5.6	9.3	1.834	8.29	8.44	Composite S1 S2
C204	0	8.1	6.2	1.046	8.49	8.65	H2	9.5	7.6	1.508	8.6	8.76	H2
C205	35.362	6.7	8.3	1.046	8.67	8.8	M1	8.1	9.8	1.508	8.79	8.92	M1
C206	55.839	5.1	7.1	1.046	8.83	9.04	M1	6.2	8.6	1.508	8.96	9.12	M1
C207	21.271	7.5	6	1.046	9.11	9.33	M2	8.8	7.2	1.508	9.21	9.44	M2
C208	108.006	6.2	7.7	0.465	9.36	9.35	S1	7.6	9.2	0.733	9.47	9.47	S1

Table C-4
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Full Capacity (mgd)	Average Flow						Maximum Flow					
		Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C301	60.169	3.4	6.3	0.465	9.36	9.51	M1	4.2	7.7	0.733	9.48	9.58	M1
C302	32.881	4.5	3.9	0.465	9.56	9.82	M2	5.5	5	0.733	9.64	9.91	M2
C303	-129.711	8	4.7	0.465	9.84	9.86	A2	9.1	5.9	0.733	9.94	9.96	A2
C304	65.944	7.2	8	0.465	9.87	9.87	M1	8.4	9.2	0.733	9.97	9.97	M1
C306	40.447	4.4	7.2	0.465	9.87	9.96	M1	5.6	8.5	0.733	9.98	10.07	M1
C307	40.447	4.1	4.6	0.465	9.99	10.3	M1	5	5.9	0.733	10.09	10.38	M1
C308	21.036	5	4.4	0.465	10.33	10.41	M2	6.1	5.5	0.733	10.42	10.51	M2
C309	38.736	4.3	5.1	0.465	10.43	10.53	M1	5.4	6.3	0.733	10.53	10.62	M1
C310	45.414	3.9	4.6	0.465	10.55	10.95	M1	4.8	5.8	0.733	10.65	11.03	M1
C311	41.257	4	4.2	0.465	10.98	11.35	M1	5	5.3	0.733	11.07	11.43	M1
C312	37.913	4.2	4.4	0.465	11.37	11.69	M1	5.2	5.4	0.733	11.46	11.77	M1
C313	36.285	4.3	4.5	0.465	11.71	11.84	M1	5.4	5.6	0.733	11.81	11.93	M1
C314	40.48	4.1	4.6	0.465	11.86	12.17	M1	5	5.7	0.733	11.96	12.25	M1
C315	39.375	4.1	4.4	0.465	12.2	12.84	M1	5.1	5.5	0.733	12.29	12.93	M1
C316	39.003	4.1	4.4	0.465	12.87	13.18	M1	5.1	5.5	0.733	12.96	13.27	M1
C317	29.736	4.7	4.4	0.465	13.21	13.43	M2	5.8	5.5	0.733	13.3	13.52	M2
C318	32.723	4	4.9	0.465	13.45	13.82	M1	5	6.1	0.733	13.55	13.9	M1
C319	25.538	4.5	4.4	0.465	13.86	14.14	M2	5.6	5.5	0.733	13.95	14.24	M2
C321	21.472	4.9	4.8	0.465	14.17	14.37	M2	6.1	5.9	0.733	14.27	14.46	M2
C322	18.148	5.3	5.1	0.465	14.38	14.54	M2	6.5	6.3	0.733	14.49	14.64	M2
C323	39.903	3.6	5.4	0.465	14.55	15.03	M1	4.5	6.7	0.733	14.66	15.11	M1
C324	98.774	2.9	4.1	0.465	15.08	15.42	Composite S1 S2	3.7	5.2	0.733	15.16	15.49	Composite S1 S2
C325	-15.769	5.3	3.9	0.093	15.5	15.52	A2	6.4	4.9	0.216	15.59	15.62	A2
C326	26.127	4.9	5.3	0.093	15.52	15.52	M1	6.1	6.5	0.216	15.62	15.62	M1
C327	26.127	2.2	4.9	0.093	15.52	15.58	M1	3.4	6.1	0.216	15.62	15.69	M1
C328	42.653	1.7	2.3	0.093	15.59	15.99	M1	2.5	3.6	0.216	15.7	16.06	M1
C329	48.905	1.6	1.9	0.093	16.01	16.52	M1	2.3	2.8	0.216	16.08	16.58	M1
C330	41.517	1.7	1.8	0.093	16.54	16.82	M1	2.5	2.7	0.216	16.62	16.89	M1
C331	32.529	1.9	1.9	0.093	16.84	17.14	M2	2.8	2.8	0.216	16.92	17.21	M1
C332	135.809	1.3	2	0.093	17.15	18.21	Composite S1 S2	2	3	0.216	17.23	18.27	Composite S1 S2
C333	-43.692	12	1.7	0.093	18.24	18.47	A2	12.8	2.6	0.216	18.32	18.53	A2
C334	35.505	5.9	12	0.093	18.47	18.47	M1	6.7	12.8	0.216	18.53	18.54	M1

Table C-4
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Full Capacity (mgd)	Average Flow						Maximum Flow					
		Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C335	18.319	1.7	5.9	0.093	18.47	21.54	Composite S1 S2	2.6	6.7	0.216	18.54	21.62	Composite S1 S2
C336	1.498	0	2.3	0	21.59	21.6	Dry	1.2	3.6	0	21.7	21.7	Dry
C20701	8.261	4.2	7.7	0.581	9.36	13.75	Composite S1 S2	4.9	9.2	0.775	9.47	13.81	Composite S1 S2
C20702	6.766	4.2	5.7	0.581	13.88	16.71	Composite S1 S2	4.9	6.7	0.775	13.96	16.77	Composite S1 S2
C20703	6.235	4.2	5.7	0.581	16.84	19.17	Composite S1 S2	4.9	6.7	0.775	16.92	19.23	Composite S1 S2
C20704	14.352	4.2	5.7	0.581	19.3	30.12	Composite S1 S2	4.9	6.7	0.775	19.38	30.18	Composite S1 S2
C20705	-3.047	10.4	5.7	0.581	30.25	30.37	A2	11.5	6.7	0.775	30.33	30.46	A2
C20706	9.922	4.2	10.5	0.581	30.38	36.23	Composite S1 S2	4.9	11.7	0.775	30.47	36.29	Composite S1 S2
C20707	9.363	4.2	5.7	0.581	36.36	39.25	Composite S1 S2	4.9	6.7	0.775	36.44	39.31	Composite S1 S2
C20708	11.086	4.2	5.7	0.581	39.38	42.69	Composite S1 S2	4.9	6.7	0.775	39.46	42.75	Composite S1 S2
C20709	10.702	4.2	5.7	0.581	42.82	45.32	Composite S1 S2	4.9	6.7	0.775	42.9	45.38	Composite S1 S2
C20710	11.414	4.2	5.7	0.581	45.45	49.48	Composite S1 S2	4.9	6.7	0.775	45.53	49.54	Composite S1 S2
C20711	7.999	4.2	5.7	0.581	49.61	49.76	Composite S1 S2	4.9	6.7	0.775	49.69	49.82	Composite S1 S2
C20712	9.628	4.2	5.7	0.581	49.89	54.25	Composite S1 S2	4.9	6.7	0.775	49.97	54.31	Composite S1 S2
C20713	10.555	3.6	5.7	0.427	54.38	54.76	Composite S1 S2	4	6.7	0.526	54.46	54.8	Composite S1 S2
C20714	8.229	3.6	4.9	0.427	54.87	56.92	Composite S1 S2	4	5.4	0.526	54.91	56.96	Composite S1 S2
C20715	4.526	3.7	4.9	0.427	57.03	57.61	M1	4.1	5.4	0.526	57.07	57.65	M1
C20716	2.366	5.2	4.9	0.427	57.71	58.03	M2	5.8	5.5	0.526	57.75	58.08	M2
C20717	10.211	3.6	5.6	0.427	58.07	60.74	Composite S1 S2	4	6.3	0.526	58.12	60.78	Composite S1 S2
C20718	-1.659	8.7	4.9	0.427	60.85	61.02	A2	9.3	5.4	0.526	60.89	61.08	A2
C20719	1.028	8.6	8.8	0.427	61.03	61.09	M1	9.4	9.4	0.526	61.09	61.15	M1
C20720	7.225	3.6	8.7	0.427	61.1	62.84	Composite S1 S2	4	9.5	0.526	61.16	62.88	Composite S1 S2
C20721	5.004	3.6	4.9	0.427	62.95	63.53	Composite S1 S2	4	5.4	0.526	62.99	63.57	Composite S1 S2
C20722	0	6.3	4.9	0.311	63.64	63.75	H2	6.8	5.4	0.363	63.68	63.8	H2
C20723	2.213	3.8	6.4	0.311	63.77	64.14	M1	4.1	7	0.363	63.81	64.16	M1
C20724	2.21	3.8	4.5	0.311	64.2	64.93	M1	4.1	4.9	0.363	64.23	64.95	M1
C20725	2.287	3.8	4.5	0.311	64.99	65.05	M1	4.2	4.9	0.363	65.02	65.08	M1
C20726	2.208	3.8	4.5	0.311	65.11	66	M1	4.1	4.9	0.363	65.14	66.02	M1
C20727	2.878	3.3	4.5	0.311	66.06	67.49	M1	3.6	4.9	0.363	66.09	67.51	M1
C20728	3.424	3.2	4.4	0.311	67.58	69.35	Composite S1 S2	3.5	4.7	0.363	67.61	69.37	Composite S1 S2
C2072702	1.144	3.6	4.4	0.311	69.44	71.37	Composite S1 S2	3.9	4.7	0.363	69.48	71.4	Composite S1 S2
C2072703	2.705	2.2	5	0.127	71.49	72.38	Composite S1 S2	2.6	5.4	0.179	71.52	72.42	Composite S1 S2

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DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Full Capacity (mgd)	Average Flow						Maximum Flow					
		Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C2072704	2.157	2.2	2.9	0.127	72.44	74.11	Composite S1 S2	2.6	3.5	0.179	72.49	74.15	Composite S1 S2
C2072705	1.932	2.4	2.9	0.127	74.17	87.41	Composite S1 S2	2.9	3.5	0.179	74.22	87.45	Composite S1 S2
C2072706	0.842	2.4	3.3	0.127	87.49	90.11	Composite S1 S2	2.9	4	0.179	87.54	90.15	Composite S1 S2

Table C-4
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Future Average Flow						Future Maximum Flow					
	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C101	25.9	7.6	2.623	-4.85	-4.63	A2	31.4	11.8	6.206	-4.5	-4.17	A2
C102	10.6	10	2.623	-4.62	-4.5	M2	16.5	15.9	6.206	-4.14	-4.01	M2
C103	8.5	11.6	2.623	-4.41	-4.36	Composite S1 S2	13.3	18.2	6.206	-3.86	-3.96	Composite S1 S2
C104	9.9	11.6	2.623	-4.1	-3.24	M1	17.1	18.7	6.206	-3.51	-2.64	M1
C105	11.9	12	1.056	-3.07	-3	M1	20.6	20.1	2.828	-2.39	-2.27	M2
C106	9.8	12.1	1.056	-2.98	-2.89	M1	19.1	21	2.828	-2.24	-2.11	M1
C107	8.7	10.1	1.056	-2.86	-2.68	M1	17.7	19.6	2.828	-2.07	-1.92	M1
C108	12.4	9.2	1.056	-2.64	-2.49	A2	21.5	18.3	2.828	-1.88	-1.73	A2
C109	12.9	12.6	1.056	-2.47	-2.46	A2	22.4	21.9	2.828	-1.69	-1.67	A2
C110	5.5	13	1.056	-2.44	-2.19	M1	12.9	22.8	2.828	-1.63	-1.57	M1
C111	6.5	7.2	0.897	-2.05	-1.57	M1	11.5	14.1	2.398	-1.47	-1.15	M1
C112	10.8	7.3	0.835	-1.5	-1.29	A2	16.3	12.6	2.231	-1.06	-0.83	A2
C113	6.4	10.9	0.835	-1.28	-1.11	M1	12.1	16.8	2.231	-0.79	-0.63	M1
C114	7.3	7.1	0.835	-1.05	-0.76	M2	12.8	13	2.231	-0.56	-0.31	M1
C115	7.9	7.8	0.835	-0.72	-0.7	M2	13.7	13.5	2.231	-0.24	-0.22	M2
C116	8.7	8.3	0.835	-0.67	-0.51	M2	14.9	14.3	2.231	-0.17	0.01	M2
C117	8.1	9	0.835	-0.48	-0.47	M1	14.6	15.4	2.231	0.06	0.07	M1
C118	3	8.5	0.155	-0.44	-0.39	M1	9.2	15.2	0.423	0.12	0.13	M1
C119	2.8	3.2	0.155	-0.37	0.06	M1	4.9	9.3	0.423	0.13	0.24	M1
C120	2.6	3.1	0.155	0.09	0.15	M1	4.5	5.3	0.423	0.27	0.31	M1
C121	3.1	2.9	0.155	0.18	0.61	M2	5.1	5	0.423	0.35	0.77	M2
C122	2.3	3.4	0.104	0.63	1.21	M1	3.8	5.6	0.287	0.81	1.33	M1
C123	2.6	2.6	0.104	1.23	1.62	M2	4.3	4.3	0.287	1.37	1.76	M1
C124	1.8	2.8	0.104	1.63	1.77	Composite S1 S2	3	4.7	0.287	1.79	1.87	Composite S1 S2
C201	5.2	12	1.567	-3.07	7.77	Composite S1 S2	7.7	20.1	3.378	-2.39	7.98	Composite S1 S2
C202	8.1	7	1.567	7.92	8.19	M2	11.6	10.3	3.378	8.2	8.49	M2
C203	5.2	8.6	1.567	8.24	8.4	Composite S1 S2	7.7	12.4	3.378	8.55	8.61	Composite S1 S2
C204	9.1	7	1.381	8.55	8.73	H2	12.7	10.3	3.052	8.83	9.03	H2
C205	7.8	9.3	1.381	8.75	8.89	M1	11.6	13.2	3.052	9.07	9.21	M1
C206	5.9	8.2	1.381	8.92	9.1	M1	9.2	12.3	3.052	9.26	9.37	M1
C207	8.5	6.8	1.381	9.18	9.41	M2	12.2	10.5	3.052	9.48	9.72	M2
C208	7.2	8.8	0.465	9.44	9.44	S1	11.2	12.7	0.733	9.77	9.77	S1

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DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Future Average Flow						Future Maximum Flow					
	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C301	3.5	7.3	0.465	9.45	9.52	M1	6.7	11.2	0.733	9.77	9.78	M1
C302	4.5	4	0.465	9.56	9.82	M2	5.8	6.8	0.733	9.8	9.93	M1
C303	8	4.7	0.465	9.84	9.86	A2	9.3	6.1	0.733	9.96	9.98	A2
C304	7.2	8	0.465	9.87	9.87	M1	8.6	9.4	0.733	9.98	9.98	M1
C306	4.4	7.2	0.465	9.87	9.96	M1	5.7	8.6	0.733	9.99	10.07	M1
C307	4.1	4.6	0.465	9.99	10.3	M1	5	6	0.733	10.1	10.38	M1
C308	5	4.4	0.465	10.33	10.41	M2	6.1	5.5	0.733	10.42	10.51	M2
C309	4.3	5.1	0.465	10.43	10.53	M1	5.4	6.3	0.733	10.53	10.62	M1
C310	3.9	4.6	0.465	10.55	10.95	M1	4.8	5.8	0.733	10.65	11.03	M1
C311	4	4.2	0.465	10.98	11.35	M1	5	5.3	0.733	11.07	11.43	M1
C312	4.2	4.4	0.465	11.37	11.69	M1	5.2	5.4	0.733	11.46	11.77	M1
C313	4.3	4.5	0.465	11.71	11.84	M1	5.4	5.6	0.733	11.81	11.93	M1
C314	4.1	4.6	0.465	11.86	12.17	M1	5	5.7	0.733	11.96	12.25	M1
C315	4.1	4.4	0.465	12.2	12.84	M1	5.1	5.5	0.733	12.29	12.93	M1
C316	4.1	4.4	0.465	12.87	13.19	M1	5.1	5.5	0.733	12.96	13.27	M1
C317	4.7	4.4	0.465	13.21	13.43	M2	5.8	5.5	0.733	13.3	13.52	M2
C318	4	4.9	0.465	13.45	13.82	M1	5	6.1	0.733	13.55	13.9	M1
C319	4.5	4.4	0.465	13.86	14.14	M2	5.6	5.5	0.733	13.95	14.24	M2
C321	4.9	4.8	0.465	14.17	14.37	M2	6.1	5.9	0.733	14.27	14.46	M2
C322	5.3	5.1	0.465	14.38	14.54	M2	6.5	6.3	0.733	14.49	14.64	M2
C323	3.6	5.4	0.465	14.55	15.03	M1	4.5	6.7	0.733	14.66	15.11	M1
C324	2.9	4.2	0.465	15.08	15.42	Composite S1 S2	3.7	5.2	0.733	15.16	15.49	Composite S1 S2
C325	5.3	3.9	0.093	15.5	15.52	A2	6.4	4.9	0.216	15.59	15.62	A2
C326	4.9	5.3	0.093	15.52	15.52	M1	6.1	6.5	0.216	15.62	15.62	M1
C327	2.2	4.9	0.093	15.52	15.58	M1	3.4	6.1	0.216	15.62	15.69	M1
C328	1.7	2.3	0.093	15.59	15.99	M1	2.5	3.6	0.216	15.7	16.06	M1
C329	1.6	1.9	0.093	16.01	16.52	M1	2.3	2.8	0.216	16.08	16.58	M1
C330	1.7	1.8	0.093	16.54	16.82	M1	2.5	2.7	0.216	16.62	16.89	M1
C331	1.9	1.9	0.093	16.84	17.14	M2	2.8	2.8	0.216	16.92	17.21	M1
C332	1.3	2	0.093	17.15	18.21	Composite S1 S2	2	3	0.216	17.23	18.27	Composite S1 S2
C333	12	1.7	0.093	18.24	18.47	A2	12.8	2.6	0.216	18.32	18.53	A2
C334	5.9	12	0.093	18.47	18.47	M1	6.7	12.8	0.216	18.53	18.54	M1

Table C-4
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

Pipe Label	Future Average Flow						Future Maximum Flow					
	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C335	1.7	5.9	0.093	18.47	21.54	Composite S1 S2	2.6	6.7	0.216	18.54	21.62	Composite S1 S2
C336	0	2.3	0	21.59	21.6	Dry	1.2	3.6	0	21.7	21.7	Dry
C20701	5.4	8.8	0.916	9.44	13.85	Composite S1 S2	8.7	12.7	2.319	9.77	14.12	Composite S1 S2
C20702	5.4	7.3	0.916	14.01	16.81	Composite S1 S2	8.7	12.1	2.319	14.4	17.08	Composite S1 S2
C20703	5.4	7.3	0.916	16.97	19.27	Composite S1 S2	8.7	12.1	2.319	17.36	19.54	Composite S1 S2
C20704	5.4	7.3	0.916	19.43	30.22	Composite S1 S2	8.7	12.1	2.319	19.82	30.49	Composite S1 S2
C20705	12.2	7.3	0.916	30.38	30.52	A2	18	12.1	2.319	30.77	31	CompositeA2PressureProfile
C20706	5.4	12.4	0.916	30.53	36.33	Composite S1 S2	8.7	18.8	2.319	31.06	36.6	Composite Pressure S1 S2
C20707	5.4	7.3	0.916	36.49	39.35	Composite S1 S2	8.7	12.1	2.319	36.88	39.62	Composite S1 S2
C20708	5.4	7.3	0.916	39.51	42.79	Composite S1 S2	8.7	12.1	2.319	39.9	43.06	Composite S1 S2
C20709	5.4	7.3	0.916	42.95	45.42	Composite S1 S2	8.7	12.1	2.319	43.34	45.69	Composite S1 S2
C20710	5.4	7.3	0.916	45.58	49.58	Composite S1 S2	8.7	12.1	2.319	45.97	49.85	Composite S1 S2
C20711	5.4	7.3	0.916	49.74	49.86	Composite S1 S2	8.7	12.1	2.319	50.13	50.13	Composite S1 S2
C20712	5.4	7.3	0.916	50.02	54.35	Composite S1 S2	8.7	12.1	2.319	50.41	54.62	Composite S1 S2
C20713	4.9	7.3	0.762	54.51	54.87	Composite S1 S2	8.2	12.1	2.07	54.9	55.14	Composite S1 S2
C20714	4.9	6.6	0.762	55.01	57.03	Composite S1 S2	8.2	11.3	2.07	55.4	57.3	Composite S1 S2
C20715	5	6.6	0.762	57.17	57.72	M1	8.5	11.3	2.07	57.56	58.01	M1
C20716	7	6.6	0.762	57.85	58.18	M2	12.5	11.3	2.07	58.25	58.64	M2
C20717	4.9	7.6	0.762	58.24	60.85	Composite S1 S2	8.2	13.6	2.07	58.73	61.12	Composite S1 S2
C20718	10.7	6.6	0.762	60.99	61.19	A2	16.7	11.3	2.07	61.38	61.7	A2
C20719	11	10.9	0.762	61.21	61.29	M2	19.9	17.4	2.07	61.75	62.03	CompositeM2PressureProfile
C20720	4.8	11.2	0.754	61.31	62.94	Composite S1 S2	8.1	20.5	2.046	62.08	63.22	Composite Pressure S1 S2
C20721	4.8	6.6	0.754	63.09	63.63	Composite S1 S2	8.1	11.2	2.046	63.48	63.91	Composite S1 S2
C20722	8.5	6.6	0.638	63.78	63.94	H2	14.4	11.2	1.883	64.17	64.43	H2
C20723	5.5	8.8	0.638	63.96	64.28	M1	12.5	15.1	1.883	64.49	64.86	Composite Pressure M1
C20724	5.5	6.6	0.638	64.37	65.07	M1	11	13.8	1.883	64.97	65.53	M1
C20725	5.8	6.6	0.638	65.16	65.21	M1	12.1	12.7	1.883	65.67	65.74	M1
C20726	5.5	6.7	0.638	65.29	66.14	M1	10.8	13.5	1.883	65.86	66.58	M1
C20727	4.8	6.6	0.638	66.23	67.61	M1	8.8	12.5	1.883	66.73	67.95	M1
C20728	4.7	6.4	0.638	67.74	69.47	Composite S1 S2	8.2	11.6	1.883	68.18	69.77	Composite S1 S2
C2072702	5.3	6.4	0.638	69.61	71.51	M1	52.4	11.6	1.883	70.04	75.44	Pressure
C2072703	4.4	7.4	0.507	71.69	72.57	Composite S1 S2	49.5	57.7	1.699	75.88	76.33	Pressure

Table C-4
DELCORA Act 537 Plan Update - November 2005
SewerCAD Model Pipe Information - Southwest Model

	Future Average Flow						Future Maximum Flow					
Pipe Label	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description	Depth In (in)	Depth Out (in)	Total Flow (mgd)	Hydraulic Grade Line Out (ft)	Hydraulic Grade Line In (ft)	Profile Description
C2072704	4.4	6.1	0.507	72.71	74.3	Composite S1 S2	43.7	51.6	1.699	76.5	77.57	Pressure
C2072705	5	6.1	0.507	74.44	87.63	Composite S1 S2	9.7	45.8	1.699	77.75	88.02	Pressure
C2072706	5	7.2	0.507	87.81	90.33	Composite S1 S2	119.9	20.3	1.699	88.9	99.9	Pressure

Appendix D
PNDI Search Records

Package contains 2 PNDI Requests

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write *"Return Receipt Requested"* on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
US Fish + Wildlife Service
Endangered Species Biologist
315 South Allen St., Suite 322
State College, PA 16801

4a. Article Number Return Receipt Requested
Z 070 652 214

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☒ Return Receipt for Merchandise ☐ COD

7. Date of Delivery 9/15/05

5. Received By: (Print Name)
Tina Beatrice

6. Signature: (Addressee or Agent)
X

8. Addressee's Address (Only if requested and fee is paid)

PS Form 3811, December 1994 102595-98-B-0229 Domestic Return Receipt

Thank you for using Return Receipt Service.

Is your RETURN ADDRESS completed on the reverse side?

Package contains 3 PNDI Requests

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write *"Return Receipt Requested"* on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Ecological Services Section
Dept. of Conservation + Natural Resources
Bureau of Forestry
P.O. Box 8552
Harrisburg, PA 17105-8552

4a. Article Number Return Receipt Requested
Z 070 652 215

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery SEP 15 2005

5. Received By: (Print Name)

6. Signature: (Addressee or Agent)
X

8. Addressee's Address (Only if requested and fee is paid)

PS Form 3811, December 1994 102595-98-B-0229 Domestic Return Receipt

Thank you for using Return Receipt Service.

Is your RETURN ADDRESS completed on the reverse side?

Package Contains 2 PNDI Requests

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write *"Return Receipt Requested"* on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Natural Diversity Section
PA Fish + Boat Commission
Div. of Environmental Services
450 Robinson Lane
Bellefonte, PA 16823

4a. Article Number Return Receipt Requested
Z 070 652 213

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery 9-16-05

5. Received By: (Print Name)

6. Signature: (Addressee or Agent)
X

8. Addressee's Address (Only if requested and fee is paid)

PS Form 3811, December 1994 102595-98-B-0229 Domestic Return Receipt

Thank you for using Return Receipt Service.

Is your RETURN ADDRESS completed on the reverse side?

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850

October 27, 2005

Sandra B. McCammon
Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, PA 19380

RE: USFWS Projects #2005-2995 & #2005-2996

Dear Ms. McCammon:

This responds to your letters of September 12, 2005, requesting information about federally listed and proposed endangered and threatened species within the area affected by the proposed pump station construction and outfall relocation and extension projects located in Delaware County, Pennsylvania. The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species.

Except for occasional transient species, no federally listed or proposed threatened or endangered species under our jurisdiction are known to occur within the projects' impact areas. Therefore, no biological assessment nor further consultation under the Endangered Species Act are required with the Fish and Wildlife Service. This determination is valid for two years from the date of this letter. If the proposed projects have not been fully implemented prior to this, an additional review by this office will be necessary. Also, should projects' plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered. A compilation of certain federal status species in Pennsylvania is enclosed for your information.

This response relates only to endangered or threatened species under our jurisdiction based on an office review of the proposed projects' locations. No field inspection of the projects' areas has been conducted by this office. Consequently, this letter is not to be construed as addressing potential Service concerns under the Fish and Wildlife Coordination Act or other authorities.

Requests for information regarding State-listed endangered or threatened species should be directed to the Pennsylvania Game Commission (birds and mammals), the Pennsylvania Fish and Boat Commission (fish, reptiles, amphibians and aquatic invertebrates), and the Pennsylvania Department of Conservation and Natural Resources (plants).

To avoid potential delays in reviewing your projects, please use the above-referenced USFWS projects' tracking numbers in any future correspondence regarding this project.

Please contact Pam Shellenberger of my staff at 814-234-4090 if you have any questions or require further assistance.

Sincerely,

David Densmore
Supervisor

Enclosure

Federally Listed, Proposed, and Candidate Species in Pennsylvania

(revised July 27, 2004)

Common Name	Scientific Name	Status[1]	Distribution (Counties and/or Watersheds)
MAMMALS			
Indiana bat	*Myotis sodalis*	E	Hibernacula: Armstrong, Blair, Fayette, Lawrence, Luzerne, Mifflin and Somerset Co. Maternity sites: Blair Co.
BIRDS			
Bald eagle	*Haliaeetus leucocephalus*	T	Nesting: Armstrong, Berks, Butler, Centre, Chester, Crawford, Dauphin, Erie, Forest, Huntingdon, Lancaster, Lebanon, Lycoming, Mercer, Monroe, Montgomery, Northumberland, Pike, Tioga, Venango, Warren, Wayne and York Co. Winter: near ice-free sections of rivers, lakes and reservoirs (e.g., Delaware River, Pymatuning Reservoir)
Piping plover	*Charadrius melodus*	E	Migratory. No nesting in Pennsylvania since 1950s. Designated critical habitat on Presque Isle (Erie Co)
REPTILES			
Bog turtle	*Clemmys (Glyptemys) muhlenbergii*	T	Adams, Berks, Bucks, Chester, Cumberland, Delaware, Franklin, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York Co. [Historically found in Crawford, Mercer and Philadelphia Co.]
E. massasauga rattlesnake	*Sistrurus catenatus catenatus*	C	Butler, Crawford, Mercer and Venango Co. [Historically found in Allegheny and Lawrence Co.]
MUSSELS			
Clubshell	*Pleurobema clava*	E	French Creek and Allegheny River (and some tributaries) in Clarion, Crawford, Erie, Forest, Mercer, Venango, and Warren Co.; Shenango River (Mercer and Crawford Co.) [Has not been found recently in 13 streams of historical occurrence in Butler, Beaver, Fayette, Greene, Lawrence, Mercer, and Westmoreland Co.]
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Delaware River (Wayne Co.). [Has not been found recently in streams of historical occurrence in the Delaware River watershed (Bucks, Carbon, Chester, Philadelphia Co.) or Susquehanna River watershed (Lancaster Co.)]
Northern riffleshell	*Epioblasma torulosa rangiana*	E	French Creek and Allegheny River (and some tributaries) in Clarion, Crawford, Erie, Forest, Mercer, Venango, and Warren Co. [Has not been found recently in streams of historical occurrence, including: Shenango River (Lawrence Co.), Conewango Creek (Warren Co.)]

US Fish and Wildlife Service
315 South Allen Street, Suite 322, State College, Pennsylvania 16801

Common Name	Scientific Name	Status[1]	Distribution (Counties and/or Watersheds)
MUSSELS (continued)			
Rayed bean	*Villosa fabalis*	C	French Creek and Allegheny River (Armstrong, Clarion, Crawford, Erie, Forest, Mercer, Venango, Warren Co.); Cussewago Creek (Crawford Co.). [Has not been found recently in 5 streams of historical occurrence in Armstrong, Lawrence, Mercer and Warren Co.]
Sheepnose	*Plethobasus cyphyus*	C	Allegheny River (Forest and Venango Co.). [Has not been found recently in streams of historical occurrence, including: Allegheny River (Armstrong Co.), Beaver River (Lawrence Co.), Ohio River (Allegheny and Beaver Co.), and Monongahela River (Washington Co.)]
FISH			
Shortnose sturgeon[2]	*Acipenser brevirostrum*	E	Delaware River and other Atlantic coastal waters
PLANTS			
Northeastern bulrush	*Scirpus ancistrochaetus*	E	Adams, Bedford, Blair, Carbon, Centre, Clinton, Columbia, Cumberland, Dauphin, Franklin, Huntingdon, Lackawanna, Lehigh, Lycoming, Mifflin, Monroe, Perry, Snyder, Tioga, and Union Co. [Historically found in Northampton Co.]
Small-whorled pogonia	*Isotria medeoloides*	T	Centre, Chester, and Venango Co. [Historically found in Berks, Greene, Monroe, Montgomery and Philadelphia Co.]

[1] E = Endangered; T = Threatened; P = Proposed for listing; C = Candidate
[2] Shortnose sturgeon is under the jurisdiction of the National Marine Fisheries Service

established 1866

Pennsylvania Fish & Boat Commission

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

November 1, 2005

IN REPLY REFER TO
SIR# 20978

WESTON SOLUTIONS
SANDRA MCCAMMON
1400 WESTON WAY
PO BOX 2653
WEST CHESTER, PA 19380

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 20050831004779
→ RIVERTOWN FORCE MAIN
CHESTER CITY, DELAWARE County, Pennsylvania

Dear MS. MCCAMMON:

I have examined the map accompanying your recent correspondence which shows the location for the above referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and our own files, the following rare or protected species are known from the vicinity of the project site:

Common Name	Scientific Name	PA Status
Red-bellied turtle	*Pseudemys rubriventris*	threatened

The red-bellied turtle is one of Pennsylvania's largest native aquatic turtles. This turtle species is known to inhabit relatively large, deep streams, rivers, ponds, lakes and marshes with permanent water and ample basking sites. Red-bellied turtles are restricted to the southcentral and southeastern regions of the Commonwealth. The existence of this turtle species is threatened by habitat destruction, poor water quality, and competition with aggressive non-native turtle species that share its range and habitat (e.g., red-eared slider, *Trachemys scripta elegans*).

Red-bellied turtles are known from near the project area. It is possible that they could also occur in any wetlands and water bodies on-site. Therefore, if wetlands with open water areas, streams or ponds are to be disturbed from the project activity, we will need to conduct a more thorough evaluation of the potential adverse impacts to the red-bellied turtle. Items including detailed project plans, project narrative, aerial photographs of the general area, general habitat descriptions, and color photographs of the project area, wetlands identification and delineation, stream characterization (flow velocity, width, depth, substrate type, pools and riffles, identification of basking areas, logs, woody debris, presence of aquatic vegetation) would expedite our review process. Pending the review of information, a survey for targeting the presence of the species of concern may be warranted. However, if wetlands or water bodies are not to be disturbed by the proposed activity, and provided that best management practices are employed and strict erosion and

sedimentation measures are maintained, I do not foresee any adverse impacts to red-bellied turtle or any other rare or protected species under Pennsylvania Fish and Boat Commission jurisdiction.

If you have any questions regarding this response, please contact this office at the above number and refer to the SIR number at the top of this letter. Thank you for your cooperation and attention to this matter of endangered species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

cc: DEP, SE Region

Pennsylvania Department of Conservation and Natural Resources

Bureau of Forestry

June 28, 2006

Elizabeth Bolt
Weston Solutions, Inc.
FAX: 610-701-3186 (hard copy will NOT follow)

***Pennsylvania Natural Diversity Inventory Review, PNDI* Number**	**20051213013756**
Smith and Price Streets Force Main Trainer Borough, Delaware County	

Dear Ms.Bolt,

This responds to your request about a Pennsylvania Natural Diversity Inventory (PNDI) ER Tool "Potential Impact" or a species of special concern impact review. **We screened this project for potential impacts to species and resources of special concern under the Department of Conservation and Natural Resources' responsibility, which includes plants, natural communities, terrestrial invertebrates and geologic features only.**

☒ ***NO PROJECT IMPACT ANTICIPATED***

☐ PNDI records indicate that no known occurrences of species or resources of special concern under DCNR's jurisdiction occur in the vicinity of the project. Therefore, we do not anticipate the project referenced above will impact plants, natural communities, terrestrial invertebrates and geologic features of special concern. No further coordination with DCNR is needed for this project.

☒ PNDI records indicate special concern species or resources are located in the vicinity of the project. However, based on the information submitted to us concerning the nature of the project, the immediate location, and our detailed resource information, we determined that no impact is likely. No further coordination with DCNR is needed for this project.

☐ ***POTENTIAL PROJECT IMPACT - UNDER FURTHER REVIEW***
Based on our PNDI map review we determined potential impacts to species and/or resources of special concern. This project has been passed on to our review committee. The committee will contact the applicant/consultant directly if more information is needed to assess the project's potential impacts. Response time is typically less than a month after the date on this notification.

COMMENTS:

This response represents the most up-to-date summary of the PNDI data files and is good for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on-site. A field survey of any site may reveal previously unreported populations. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

This finding applies to impacts to plants, natural communities, terrestrial invertebrates and geologic features only. To complete your review of state and federally-listed species of special concern, please be sure the U.S. Fish and Wildlife Service, the PA Game Commission and the Fish and Boat Commission has been contacted regarding this project either directly or by performing a search with the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Ellen Shultzabarger, Environmental Review Specialist FOR Chris Firestone, Plant Program Mgr
DCNR/BOF/PNDI, PO Box 8552, Harrisburg, PA 17105 ~ Ph: 717-772-0258 ~ F: 717-772-0271 ~ e-eshultza@state.pa.us

Pennsylvania Department of Conservation and Natural Resources

Bureau of Forestry

November 29, 2005

Sandra B. McCammon
Weston Solutions, Inc.
FAX: 610-701-3186 (hard copy will NOT follow)

Pennsylvania Natural Diversity Inventory Review, PNDI 20050824004377
Chester Creek East Interceptor
Upland Chester City Twp, Delaware County

Dear Ms. McCammon,

This responds to your request about a Pennsylvania Natural Diversity Inventory (PNDI) ER Tool "Potential Impact" or a species of special concern impact review. We screened this project for potential impacts to species and resources of special concern under the Department of Conservation and Natural Resources' responsibility, which includes plants, natural communities, terrestrial invertebrates and geologic features only.

☒ ***NO PROJECT IMPACT ANTICIPATED***

☐ PNDI records indicate that no known occurrences of species or resources of special concern under DCNR's jurisdiction occur in the vicinity of the project. Therefore, we do not anticipate the project referenced above will impact plants, natural communities, terrestrial invertebrates and geologic features of special concern. No further coordination with DCNR is needed for this project.

☒ PNDI records indicate special concern species or resources are located in the vicinity of the project. However, based on the information submitted to us concerning the nature of the project, the immediate location, and our detailed resource information, we determined that no impact is likely. No further coordination with DCNR is needed for this project.

☐ ***POTENTIAL PROJECT IMPACT - UNDER FURTHER REVIEW***

Based on our PNDI map review we determined potential impacts to species and/or resources of special concern. This project has been passed on to our review committee. The committee will contact the applicant/consultant directly if more information is needed to assess the project's potential impacts. Response time is typically less than a month after the date on this notification.

COMMENTS:

This response represents the most up-to-date summary of the PNDI data files and is good for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on-site. A field survey of any site may reveal previously unreported populations. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

This finding applies to impacts to plants, natural communities, terrestrial invertebrates and geologic features only. To complete your review of state and federally-listed species of special concern, please be sure the U.S. Fish and Wildlife Service, the PA Game Commission and the Fish and Boat Commission has been contacted regarding this project either directly or by performing a search with the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Ellen M. Shultzabarger, Environmental Review Specialist, PNHP
DCNR/BOF/PNDI, PO Box 8552, Harrisburg, PA 17105 ~ Ph: 717-772-0258 ~ F: 717-772-0271 ~ e-eshultza@state.pa.us

Pennsylvania Department of Conservation and Natural Resources

Bureau of Forestry

November 29, 2005

Sandra B. McCammon
Weston Solutions, Inc.
FAX: 610-701-3186 (hard copy will NOT follow)

Pennsylvania Natural Diversity Inventory Review, PNDI 20050824004366
Chester Creek West Interceptor
Chester City Twp, Delaware County

Dear Ms. McCammon,

This responds to your request about a Pennsylvania Natural Diversity Inventory (PNDI) ER Tool "Potential Impact" or a species of special concern impact review. We screened this project for potential impacts to species and resources of special concern under the Department of Conservation and Natural Resources' responsibility, which includes plants, natural communities, terrestrial invertebrates and geologic features only.

☒ ***NO PROJECT IMPACT ANTICIPATED***

☐ PNDI records indicate that no known occurrences of species or resources of special concern under DCNR's jurisdiction occur in the vicinity of the project. Therefore, we do not anticipate the project referenced above will impact plants, natural communities, terrestrial invertebrates and geologic features of special concern. No further coordination with DCNR is needed for this project.

☒ PNDI records indicate special concern species or resources are located in the vicinity of the project. However, based on the information submitted to us concerning the nature of the project, the immediate location, and our detailed resource information, we determined that no impact is likely. No further coordination with DCNR is needed for this project.

☐ ***POTENTIAL PROJECT IMPACT - UNDER FURTHER REVIEW***

Based on our PNDI map review we determined potential impacts to species and/or resources of special concern. This project has been passed on to our review committee. The committee will contact the applicant/consultant directly if more information is needed to assess the project's potential impacts. Response time is typically less than a month after the date on this notification.

COMMENTS:

This response represents the most up-to-date summary of the PNDI data files and is good for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on-site. A field survey of any site may reveal previously unreported populations. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

This finding applies to impacts to plants, natural communities, terrestrial invertebrates and geologic features only. To complete your review of state and federally-listed species of special concern, please be sure the U.S. Fish and Wildlife Service, the PA Game Commission and the Fish and Boat Commission has been contacted regarding this project either directly or by performing a search with the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Ellen M. Shultzabarger, Environmental Review Specialist, PNHP
DCNR/BOF/PNDI, PO Box 8552, Harrisburg, PA 17105 ~ Ph: 717-772-0258 ~ F: 717-772-0271 ~ c-eshultza@state.pa.us

Pennsylvania Department of Conservation and Natural Resources

Bureau of Forestry

November 29, 2005

Sandra B. McCammon
Weston Solutions, Inc.
FAX: 610-701-3186 (hard copy will NOT follow)

Pennsylvania Natural Diversity Inventory Review, PNDI 20050831004779
Rivertown Force Main
Chester City Twp, Delaware County

Dear Ms. McCammon,

This responds to your request about a Pennsylvania Natural Diversity Inventory (PNDI) ER Tool "Potential Impact" or a species of special concern impact review. We screened this project for potential impacts to species and resources of special concern under the Department of Conservation and Natural Resources' responsibility, which includes plants, natural communities, terrestrial invertebrates and geologic features only.

☒ ***NO PROJECT IMPACT ANTICIPATED***

☐ PNDI records indicate that no known occurrences of species or resources of special concern under DCNR's jurisdiction occur in the vicinity of the project. Therefore, we do not anticipate the project referenced above will impact plants, natural communities, terrestrial invertebrates and geologic features of special concern. No further coordination with DCNR is needed for this project.

☒ PNDI records indicate special concern species or resources are located in the vicinity of the project. However, based on the information submitted to us concerning the nature of the project, the immediate location, and our detailed resource information, we determined that no impact is likely. No further coordination with DCNR is needed for this project.

☐ ***POTENTIAL PROJECT IMPACT - UNDER FURTHER REVIEW***

Based on our PNDI map review we determined potential impacts to species and/or resources of special concern. This project has been passed on to our review committee. The committee will contact the applicant/consultant directly if more information is needed to assess the project's potential impacts. Response time is typically less than a month after the date on this notification.

COMMENTS:

This response represents the most up-to-date summary of the PNDI data files and is good for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on-site. A field survey of any site may reveal previously unreported populations. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

This finding applies to impacts to plants, natural communities, terrestrial invertebrates and geologic features only. To complete your review of state and federally-listed species of special concern, please be sure the U.S. Fish and Wildlife Service, the PA Game Commission and the Fish and Boat Commission has been contacted regarding this project either directly or by performing a search with the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Ellen M. Shultzabarger, Environmental Review Specialist, PNHP
DCNR/BOF/PNDI, PO Box 8552, Harrisburg, PA 17105 – Ph: 717-772-0258 – F: 717-772-0271 – e-eshultza@state.pa.us

Appendix E
Cultural Resources Notices

Package contains 4 Cultural Resource Notice Requests

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write *"Return Receipt Requested"* on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

SEP 16 2005

3. Article Addressed to:

PA Historical + Museum Commission
Bureau of Historic Preservation
400 North St., Second Floor
Harrisburg, PA 17120-0093

4a. Article Number

Z [illegible] 652 202 Requested

4b. Service Type

- ☐ Registered
- ☒ Certified
- ☐ Express Mail
- ☐ Insured
- ☐ Return Receipt for Merchandise
- ☐ COD

7. Date of Delivery

5. Received By: *(Print Name)*

8. Addressee's Address *(Only if requested and fee is paid)*

6. Signature: *(Addressee or Agent)*

X

PS Form **3811**, December 1994 102595-96-B-0229 Domestic Return Receipt

Thank you for using Return Receipt Service.

Is your RETURN ADDRESS completed on the reverse side?

Commonwealth of Pennsylvania
Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120-0093
www.phmc.state.pa.us

October 7, 2005

Sandra McCammon
Weston Solutions, Inc.
1400 Weston Way
PO Box 2653
West Chester, PA 19380

Re: File No. ER 2005-3169-045-A
PV, Chester Creek East Interceptor Rehabilitation Project, Upland Borough, Delaware Co.

Dear Ms. McCammon:

The Bureau for Historic Preservation (the State Historic Preservation Office) has reviewed the above named project in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended in 1980 and 1992, and the regulations (36 CFR Part 800) of the Advisory Council on Historic Preservation. These requirements include consideration of the project's potential effect upon both historic and archaeological resources.

There may be historic structures eligible for the National Register of Historic Places located in the project area. However, due to the nature of the activity, it is our opinion that there will be no effect on these properties. Should the applicant become aware, from any source, that unidentified historic resources are located at the project site, or that the project activities will have an effect on these properties, the Bureau for Historic Preservation should be contacted immediately.

In our opinion no archaeological investigations are necessary in this project area.

If you need further information regarding archaeological survey please contact Mark Shaffer at (717) 783-9900. If you need further information concerning historic structures please consult Ann Safley at (717) 787-9121.

Sincerely,

Douglas C. McLearen, Chief
Division of Archaeology & Protection

DCM/lmm

Commonwealth of Pennsylvania
Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120-0093
www.phmc.state.pa.us

October 7, 2005

Sandra McCammon
Weston Solutions, Inc.
1400 Weston Way
PO Box 2653
West Chester, PA 19380

Re: File No. ER 2005-3172-045-A
PV, Part 2 Sewage Construction, Force Main Installation, Chester City, Delaware Co.

Dear Ms. McCammon:

The Bureau for Historic Preservation (the State Historic Preservation Office) has reviewed the above named project in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended in 1980 and 1992, and the regulations (36 CFR Part 800) of the Advisory Council on Historic Preservation. These requirements include consideration of the project's potential effect upon both historic and archaeological resources.

Based on our survey files, which include both archaeological sites and standing structures, there are no National Register eligible or listed historic or archaeological properties in the area of this proposed project. Therefore, your responsibility for consultation on this project is complete.

Should artifacts or archaeological resources be encountered during construction, we request that you notify our office. This notification will not delay your project in any way. We simply wish to record this information before it is lost. The Bureau for Historic Preservation can be contacted at (717) 783-8946. Thank you in advance for this consideration.

Sincerely,

Douglas C. McLearen, Chief
Division of Archaeology & Protection

DCM/lmm

Commonwealth of Pennsylvania
Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120-0093
www.phmc.state.pa.us

September 28, 2005

Sandra McCammon
Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, PA 19380

Re: File No. ER 05-3170-045-A
PV Part 2 Sewage Construction Permit:
Chester Creek West Interceptor
Rehabilitation Project, Chester City
Delaware County

Dear Ms. McCammon:

The Bureau for Historic Preservation (the State Historic Preservation Office) has reviewed the above named project in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended in 1980 and 1992, and the regulations (36 CFR Part 800) of the Advisory Council on Historic Preservation. These requirements include consideration of the project's potential effect upon both historic and archaeological resources.

There may be historic buildings, structures, and/or archaeological resources located in the project area. In our opinion the activities described in your proposal should have no effect on these resources. Should you become aware, from any source, that unidentified historic buildings, structures, and or archaeological resources are located at the project site, or that the project activities will have an effect on these properties, the Bureau for Historic Preservation should immediately be contacted.

If you need further information regarding archaeological survey please contact Mark Shaffer at (717) 783-9900. If you need further information concerning historic structures please consult Ann Safley at (717) 787-9121.

Sincerely,

Douglas C. McLearen, Chief
Division of Archaeology &
Protection

Cc: DEP, Southeast Regional Office

DCM/tmw

Appendix F
Cost Estimates

Booth Street Interceptor (Including Feltonville Pump Station Upgrade)
Alternative 1: Parallel Piping Installation

Description	Unit	QTY	Unit Cost	Cost
Piping				
Cement-Lined 18" DIP	LF	1320	$100	$132,000
Easement	SF	13200	$25	$330,000
Clearing & Grubbing	LF	225	$50	$11,250
Excavation: 4'x15' deep, bed & bckfl.	LF	1320	$200	$264,000
Trench Box (2)	WK	20	$800	$16,000
New Sewer & Manhole Installation	EA	5	$10,000	$50,000
1095 LF of Road Repair (5' W x 1'D)	SY	608	$30	$18,248
Site Restoration	SF	3150	$3	$7,875
Subtotal: Piping				$829,373
Pump Station				
Demolition	EA	1	$50,000	$50,000
By-pass Pumping	Day	100	1000	$100,000
Centrifugal Pumps	EA	3	$75,000	$225,000
Electrical & Instrumentation Systems	EA	1	$200,000	$200,000
HVAC Upgrades	EA	1	$15,000	$15,000
Subtotal: Pump Station				$590,000
Subtotal: Piping & Pump Station				$1,419,373
Mobilization @ 15%				$212,906
Subtotal with Mobilization				$1,632,279
Engineering @20%	LS	1		$326,456
Bonds and Insurance @ 10%	LS	1		$163,228
Permits @ 5%	LS	1		$81,614
Construction Contingency @ 20%	LS	1		$326,456
Total Cost				**$2,530,033**

*All costs are estimated and are for budgetary planning purposes only.

Booth Street Interceptor (Including Feltonville Pump Station Upgrade)
Alternative 2A: Replace Existing Piping

Description	Unit	QTY	Unit Cost	Cost
Piping				
Cement-Lined 18" DIP	LF	1320	$100	$132,000
Clearing & Grubbing	LF	112	$50	$5,600
Excavation: 4'x15' deep, bed & bckfl.	LF	1320	$200	$264,000
By-pass Pumping	Day	100	1000	$100,000
Trench Box (2)	WK	20	$800	$16,000
New Sewer & Manhole Installation	EA	5	$10,000	$50,000
1208 LF of Road Repair (5' W x 1'D)	SY	671	$30	$20,131
Existing Pipe Removal & Disposal	LF	1320	$20	$26,400
Existing MH Removal & Disposal	EA	5	$900	$4,500
Site Restoration	SF	3150	$3	$7,875
Subtotal: Piping				$626,506
Pump Station				
Demolition	EA	1	$50,000	$50,000
By-pass Pumping	Day	100	1000	$100,000
Centrifugal Pumps	EA	3	$75,000	$225,000
Electrical & Instrumentation Systems	EA	1	$200,000	$200,000
HVAC Upgrades	EA	1	$15,000	$15,000
Subtotal: Pump Station				$590,000
Subtotal: Piping & Pump Station				$1,216,506
Mobilization @ 15%				$182,476
Subtotal with Mobilization				$1,398,982
Engineering @20%	LS	1		$279,796
Bonds and Insurance @ 10%	LS	1		$139,898
Permits @ 5%	LS	1		$69,949
Construction Contingency @ 20%	LS	1		$279,796
Total Cost				**$2,168,423**

*All costs are estimated and are for budgetary planning purposes only.

Booth Street Interceptor (Including Feltonville Pump Station Upgrade)
Alternative 2B: Pipe Bursting Installation

Description	Unit	QTY	Unit Cost	Cost
Piping				
18" HDPE	LF	1320	$30	$39,600
Geotechnical Investigation	EA	1	$12,000	$12,000
Trench Pit Excavation (25'x30' pits)	EA	5	$2,000	$10,000
Trench Box (2)	WK	20	$800	$16,000
Pipe Bursting	LF	1320	$300	$396,000
New Sewer & Manhole Installation	EA	5	$10,000	$50,000
Site Restoration	SF	5000	$3	$12,500
Subtotal: Piping				$536,100
Pump Station				
Demolition	EA	1	$50,000	$50,000
By-pass Pumping	Day	100	1000	$100,000
Centrifugal Pumps	EA	3	$75,000	$225,000
Electrical & Instrumentation Systems	EA	1	$200,000	$200,000
HVAC Upgrades	EA	1	$15,000	$15,000
Subtotal: Pumping				$590,000
Subtotal: Piping & Pump Station				$1,126,100
Mobilization @ 15%				$168,915
Subtotal with Mobilization				$1,295,015
Engineering @20%	LS	1		$259,003
Bonds and Insurance @ 10%	LS	1		$129,502
Permits @ 5%	LS	1		$64,751
Construction Contingency @ 20%	LS	1		$259,003
Total Cost				**$2,007,273**

*All costs are estimated and are for budgetary planning purposes only.

Chester Creek West Interceptor
Alternative 1: Parallel Piping Installation

Description	Unit	QTY	Unit Cost	Cost
Cement-Lined 18" DIP	LF	444	$100	$44,400
Easement	SF	4440	$25	$111,000
Clearing & Grubbing	LF	200	$50	$10,000
Excavation: 4'x15' deep, bed & bckfl.	LF	444	$200	$88,800
Trench Box (2)	WK	20	$800	$16,000
New Sewer & Manhole Installation	EA	3	$10,000	$30,000
244 LF of Road Repair (5' W x 1'D)	SY	136	$30	$4,066
Site Restoration	SF	2800	$3	$7,000
Subtotal				$311,266
Mobilization @ 15%				$46,690
Subtotal with Mobilization				$357,956
Engineering @20%	LS	1		$71,591
Bonds and Insurance @ 10%	LS	1		$35,796
Permits @ 5%	LS	1		$17,898
Construction Contingency @ 20%	LS	1		$71,591
Total Cost				**$554,832**

*All costs are estimated and are for budgetary planning purposes only.

Chester Creek West Interceptor
Alternative 2A: Replace Existing Piping

Description	Unit	QTY	Unit Cost	Cost
Cement-Lined 18" DIP	LF	444	$100	$44,400
Clearing & Grubbing	LF	100	$50	$5,000
Excavation: 4'x15' deep, bed & bckfl.	LF	444	$200	$88,800
By-pass Pumping	Day	100	1000	$100,000
Trench Box (2)	WK	20	$800	$16,000
Existing Pipe Removal & Disposal	LF	444	$20	$8,880
Existing MH Removal & Disposal	EA	3	$900	$2,700
New Sewer & Manhole Installation	EA	3	$10,000	$30,000
344 LF of Road Repair (5' W x 1'D)	SY	191	$30	$5,733
Site Restoration	SF	1400	$3	$3,500
Subtotal				$305,013
Mobilization @ 15%				$45,752
Subtotal with Mobilization				$350,765
Engineering @20%	LS	1		$70,153
Bonds and Insurance @ 10%	LS	1		$35,076
Permits @ 5%	LS	1		$17,538
Construction Contingency @ 20%	LS	1		$70,153
Total Cost				**$543,685**

*All costs are estimated and are for budgetary planning purposes only.

Chester Creek West Interceptor
Alternative 2B: Pipe Bursting Installation

Description	Unit	QTY	Unit Cost	Cost
18" HDPE	LF	444	$30	$13,320
Geotechnical Investigation	EA	1	$12,000	$12,000
Trench Pit Excavation	EA	3	$2,000	$6,000
By-pass Pumping	Day	100	1000	$100,000
Trench Box (2)	WK	20	$800	$16,000
Pipe Bursting	LF	444	$300	$133,200
New Sewer & Manhole Installation	EA	3	$10,000	$30,000
Site Restoration	SF	3000	$3	$7,500
Subtotal				$318,020
Mobilization @ 15%				$47,703
Subtotal with Mobilization				$365,723
Engineering @20%	LS	1		$73,145
Bonds and Insurance @ 10%	LS	1		$36,572
Permits @ 5%	LS	1		$18,286
Construction Contingency @ 20%	LS	1		$73,145
Total Cost				**$566,871**

*All costs are estimated and are for budgetary planning purposes only.

Chester Creek East Interceptor
Alternative 1: Parallel Piping Installation

Description	Unit	QTY	Unit Cost	Cost
Cement-Lined 18" DIP	LF	540	$100	$54,000
Easement	SF	5400	$25	$135,000
Clearing & Grubbing	LF	270	$50	$13,500
Excavation: 4'x15' deep, bed & bckfl.	LF	540	$200	$108,000
Trench Box (2)	WK	20	$800	$16,000
New Sewer & Manhole Installation	EA	3	$10,000	$30,000
270 ft of Road Repair (5' W x 1'D)	SY	150	$30	$4,500
Site Restoration	SF	3780	$3	$9,450
Subtotal				$370,450
Mobilization @ 15%				$55,567
Subtotal with Mobilization				$426,017
Engineering @20%	LS	1		$85,203
Bonds and Insurance @ 10%	LS	1		$42,602
Permits @ 5%	LS	1		$21,301
Construction Contingency @ 20%	LS	1		$85,203
Total Cost				**$660,326**

*All costs are estimated and are for budgetary planning purposes only.

Chester Creek East Interceptor
Alternative 2A: Replace Existing Piping

Description	Unit	QTY	Unit Cost	Cost
Cement-Lined 18" DIP	LF	540	$100	$54,000
Clearing & Grubbing	LF	135	$50	$6,750
Excavation: 4'x15' deep, bed & bckfl.	LF	540	$200	$108,000
By-pass Pumping	Day	100	1000	$100,000
Trench Box (2)	WK	20	$800	$16,000
Removal & Disposal of Existing Piping	LF	540	$20	$10,800
Existing MH Removal & Disposal	EA	3	$900	$2,700
New Sewer & Manhole Installation	EA	3	$10,000	$30,000
405 ft of Road Repair (5' W x 1'D)	SY	225	$30	$6,749
Site Restoration	SF	1890	$3	$4,725
Subtotal				$339,724
Mobilization @ 15%				$50,959
Subtotal with Mobilization				$390,683
Engineering @20%	LS	1		$78,137
Bonds and Insurance @ 10%	LS	1		$39,068
Permits @ 5%	LS	1		$19,534
Construction Contingency @ 20%	LS	1		$78,137
Total Cost				**$605,559**

*All costs are estimated and are for budgetary planning purposes only.

Chester Creek East Interceptor
Alternative 2B: Pipe Bursting Installation

Description	Unit	QTY	Unit Cost	Cost
18" HDPE	LF	544	$30	$16,320
Geotechnical Investigation	EA	1	$12,000	$12,000
Trench Pit Excavation	EA	3	$2,000	$6,000
By-pass Pumping	Day	100	1000	$100,000
Trench Box (2)	WK	20	$800	$16,000
Pipe Bursting	LF	544	$300	$163,200
New Sewer & Manhole Installation	EA	3	$10,000	$30,000
Site Restoration	SF	3000	$3	$7,500
Subtotal				$351,020
Mobilization @ 15%				$52,653
Subtotal with Mobilization				$403,673
Engineering @20%	LS	1		$80,735
Bonds and Insurance @ 10%	LS	1		$40,367
Permits @ 5%	LS	1		$20,184
Construction Contingency @ 20%	LS	1		$80,735
Total Cost				**$625,693**

*All costs are estimated and are for budgetary planning purposes only.

Price Street Pump Station and Force Main Cost Estimate

Item	Unit	Quantity	Unit Cost	Cost
Excavation	CY	3000	$20	$60,000
Dewatering	Day	75	$1,500	$112,500
Package Pump Station	LS	1	$250,000	$250,000
Pumps	EA	3	$30,000	$90,000
Additional Piping / Valving	LS	1	$10,000	$10,000
Gravity Interceptor Connection	LS	1	$10,000	$10,000
Electrical	LS	1	$20,000	$20,000
Potable Water Connection	LS	1	$5,000	$5,000
Site Restoration	LS	1	$5,000	$5,000
Force Main Tie-In	LF	100	$150	$15,000
Sub-Total				$577,500
Mobilization @15%				$86,625
Sub-Total with Mobilization				$664,125
Engineering & Legal @ 20%				$132,825
Bonds & Insurance @10%				$66,413
Permits @ 5%				$33,206
Construction Contingency @ 30%				$199,238
Total				$1,095,806

DELCORA Trainer Borough
Alternative #1 - Gravity Sewer Smith Street to Marcus Hook Pump Station

Description	Unit	QTY	Unit Cost	Cost
10" RCP by Trench Installation (no restoration)	LF	300	$150	$45,000
10" RCP Creek Crossing by Jack and Bore (no excavation)	LF	100	$500	$50,000
Jack and Bore Pit Excavations (2 per site)	EA	2	$10,000	$20,000
Manholes (14' deep, installed)	EA	2	$10,000	$20,000
24" CIP Upgrade by Trenching Installation (no restoration)	LF	375	$150	$56,250
24" RCP Rail Crossing by Jack and Bore (with excavation)	EA	2	$100,000	$200,000
Connection / Modification of Manholes	EA	6	$1,500	$9,000
Demolition of Existing Pump System	LS	1	$6,000	$6,000
Twin Pumps and 25 HP Motors	LS	1	$40,000	$40,000
Suction Pipe	LF	25	$200	$5,000
Slide Gate	EA	2	$10,000	$20,000
Discharge Pipe	LF	70	$200	$14,000
Gate Valve	EA	2	$10,000	$20,000
Check Valve	EA	2	$10,000	$20,000
Emergency Generator & Concrete Pad	LS	1	$10,000	$10,000
Electrical and Instrumentation	LS	1	$45,000	$45,000
Motor Control Center	LS	1	$30,000	$30,000
Inspection and Training	DAY	2	$750	$1,500
Shoring (10'x20' trench box & machine)	DAY	20	$500	$10,000
Dewatering (4" diaphram)	DAY	14	$685	$9,590
Bypass Pumping (6" centrifugal pump)	DAY	20	$865	$17,300
Flow Meter (Parshall Flume and Transponder)	EA	1	$30,000	$30,000
Sediment Erosion Control (15' wide)	LF	150	$3	$492
Easement Acquisition	LF	400	$10	$4,000
Clearing and Grubbing (11' wide)	LF	150	$1	$150
Traffic Control	DAY	4	$750	$3,000
Road Repair	100 LF	1	$3,000	$3,000
Site Restoration	LF	150	$2	$300
Subtotal				**$689,582**

Description	Cost
Sub Total Construction	$689,582
Mobilization (@15%)	$103,437
Total Construction Cost	$793,019
Engineering and Legal @25%	$198,255
Bonds and Insurance @ 10%	$79,302
Permits @ 5%	$39,651
Construction Contingency @ 30%	$237,906
Total Cost	**$1,348,133**

DELCORA Trainer Borough
Alternative #2 - Force Main Smith Street to Marcus Hook Pump Station

Description	Unit	QTY	Unit Cost	Cost
8" FM by Trench Installation (no restoration)	LF	350	$75	$26,250
8" FM by Jack and Bore (24"Casing & 8"FM)	LF	100	$500	$50,000
Jack and Bore Pit Excavations (2 per site)	EA	2	$10,000	$20,000
Thrust supports	EA	2	$800	$1,600
24" CIP Upgrade by Trenching Installation (no restoration)	LF	375	$150	$56,250
24" RCP Rail Crossing by Jack and Bore (with excavation)	EA	2	$100,000	$200,000
Connection / Modification of Manholes	EA	6	$1,500	$9,000
Demolition of Existing Pump System	LS	1	$6,000	$6,000
Twin Pumps and 25 HP Motors	LS	1	$40,000	$40,000
Suction Pipe	LF	25	$200	$5,000
Slide Gate	EA	2	$10,000	$20,000
Discharge Pipe	LF	70	$200	$14,000
Gate Valve	EA	2	$10,000	$20,000
Check Valve	EA	2	$10,000	$20,000
Emergency Generator & Concrete Pad	LS	1	$10,000	$10,000
Electrical and Instrumentation	LS	1	$45,000	$45,000
Motor Control Center	LS	1	$30,000	$30,000
Inspection and Training	DAY	2	$750	$1,500
Shoring (8'x16' trench box & machine)	DAY	4	$500	$2,000
Dewatering (4"diaphram)	DAY	4	$685	$2,740
Bypass Pumping (6" centrifugal pump)	DAY	7	$865	$6,055
Flow Meter (Magmeter)	LF	1	$15,000	$15,000
Sediment Erosion Control (15' wide)	LF	850	$3	$2,550
Easement Acquisition	LF	450	$10	$4,500
Clearing and Grubbing (11' wide)	LF	150	$1	$150
Traffic Control	DAY	4	$750	$3,000
Road Repair	100 LF	1	$3,000	$3,000
Site Restoration	LF	150	$2	$300
Subtotal				**$613,895**

Description	Cost
Sub Total Construction	$613,895
Mobilization (@15%)	$92,084
Total Construction Cost	$705,979
Engineering and Legal @25%	$176,495
Bonds and Insurance @ 10%	$70,598
Permits @ 5%	$35,299
Construction Contingency @ 30%	$211,794
Total Cost	**$1,200,165**

DELCORA Trainer Borough
Alternative #3 - Force Main Smith Street to Gravity Sewer to DELCORA Pump Station

Description	Unit	QTY	Unit Cost	Cost
8" FM by Trench Installation (no restoration)	LF	1200	$75	$90,000
8" FM by Jack and Bore (24"Casing & 8"FM)	LF	100	$500	$50,000
Jack and Bore Pit Excavations (2 per site)	EA	2	$10,000	$20,000
Thrust supports	EA	5	$800	$4,000
Air Relief Valve and Vault	EA	1	$12,000	$12,000
Blow off Vault	EA	2	$35,000	$70,000
24" CIP Upgrade by Trenching Installation (no restoration)	LF	375	$150	$56,250
24" RCP Rail Crossing by Jack and Bore (with excavation)	EA	2	$100,000	$200,000
Connection / Modification of Manholes	EA	6	$1,500	$9,000
Shoring (8'x16' trench box& machine)	DAY	8	$500	$4,000
Dewatering (4"diaphram)	DAY	8	$685	$5,480
Bypass Pumping (6" centrifugal pump)	DAY	7	$865	$6,055
Flow Meter (Magmeter)	LF	1	$15,000	$15,000
Sediment Erosion Control (15' wide)	LF	850	$3	$2,550
Easement Acquisition	LF	1300	$10	$13,000
Clearing and Grubbing (11' wide)	LF	850	$1	$850
Traffic Control	DAY	10	$750	$7,500
Road Repair	100 LF	1	$3,000	$3,000
Site Restoration	LF	850	$2	$1,700
Subtotal				**$570,385**

Description	Cost
Sub Total Construction	$570,385
Mobilization (@15%)	$85,558
Total Construction Cost	$655,943
Engineering and Legal @25%	$163,986
Bonds and Insurance @ 10%	$65,594
Permits @ 5%	$32,797
Construction Contingency @ 30%	$196,783
Total Cost	**$1,115,103**

DELCORA Trainer Borough
Alternative #4 - Force Main Smith Street to DELCORA Pump Station

Description	Unit	QTY	Unit Cost	Cost
8" FM by Trench Installation (no restoration)	LF	2100	$75	$157,500
8" FM Creek Crossing by Jack and Bore	LF	100	$500	$50,000
Jack and Bore Pit Excavations (2 per site)	EA	2	$10,000	$20,000
8" FM Rail Crossing by Jack and Bore (with excavation)	EA	2	$100,000	$200,000
Thrust supports	EA	7	$800	$5,600
Air Relief Valve and Vault	EA	1	$12,000	$12,000
Blow off Vault	EA	2	$35,000	$70,000
Connection / Modification of Manholes	EA	2	$1,500	$3,000
Shoring (8'x16' trench box& machine)	DAY	14	$500	$7,000
Dewatering (4"diaphram)	DAY	14	$685	$9,590
Bypass Pumping (6" centrifugal pump)	DAY	7	$865	$6,055
Flow Meter (Magmeter)	LF	1	$15,000	$15,000
Sediment Erosion Control (15' wide)	LF	1200	$3	$3,600
Easement Acquisition	LF	2200	$10	$22,000
Clearing and Grubbing (11' wide)	LF	1200	$1	$1,200
Traffic Control	DAY	10	$750	$7,500
Road Repair	100 LF	1	$3,000	$3,000
Site Restoration	LF	1200	$2	$2,400
Subtotal				**$595,445**

Description	Cost
Sub Total Construction	$595,445
Mobilization (@15%)	$89,317
Total Construction Cost	$684,762
Engineering and Legal @25%	$171,190
Bonds and Insurance @ 10%	$68,476
Permits @ 5%	$34,238
Construction Contingency @ 30%	$205,429
Total Cost	**$1,164,095**

DELCORA Trainer Borough
Alternative #5 - Force Main Smith Street to Mary Street

Description	Unit	QTY	Unit Cost	Cost
8" FM by Trench Installation (no restoration)	LF	3900	$75	$292,500
8" FM by Jack and Bore (24"Casing & 8"FM)	LF	100	$500	$50,000
Jack and Bore Pit Excavations (2 per site)	EA	2	$10,000	$20,000
Thrust supports	EA	5	$800	$4,000
Air Relief Valve and Vault	EA	1	$12,000	$12,000
Blow off Vault	EA	1	$35,000	$35,000
Connection / Modification of MH	EA	2	$1,500	$3,000
Shoring (8'x16' trench box& machine)	DAY	15	$500	$7,500
Dewatering (4"diaphram)	DAY	14	$685	$9,590
Bypass Pumping (6" centrifugal pump)	DAY	7	$865	$6,055
Flow Meter (Magmeter)	LF	1	$15,000	$15,000
Sediment Erosion Control	LF	800	$3	$2,400
Easement Acquisition	LF	0	$10	$0
Clearing and Grubbing (11' wide)	LF	500	$1	$500
Traffic Control	DAY	30	$750	$22,500
Road Repair	100 LF	37	$3,000	$111,000
Site Restoration	LF	1000	$2	$2,000
Subtotal				**$593,045**

Description	Cost
Sub Total Construction	$593,045
Mobilization (@15%)	$88,957
Total Construction Cost	$682,002
Engineering and Legal @25%	$170,500
Bonds and Insurance @ 10%	$68,200
Permits @ 5%	$34,100
Construction Contingency @ 30%	$204,601
Total Cost	**$1,159,403**

CSO Outfall Reconstruction Cost Estimates

An outfall cost estimate was prepared based on potential improvements to the Reaney Street Outfall (No. 7) adjacent to the Barry Bridge Park. Improvements being considered by DELCORA include relocation and extension of the outfall to provide discharge directly into the Delaware River. This would involve the following:

- One new manhole at the existing outfall;
- 48-inch ductile iron pipe outfall extension around the wooded channel and approximately 75 feet into the Delaware River (total of 550 LF);
- 2 additional new manholes at bends in the proposed outfall extension; and
- Outfall pilings.

Estimated costs based on these assumptions are summarized in Table 5-2A.

Table 5-2A

Rivertown CSO Improvements Cost Estimate – No. 7, Reaney St.

Description	Capital Cost[1]	Contingency[2]	Engineering & Legal Costs[2]	Total Cost
550 LF of 48-inch DIP	$220,000	$55,000	$55,000	$330,000
3 New 72-inch Manholes	$30,000	$7,500	$7,500	$45,000
Outfall Piling	$45,000	$11,250	$11,250	$67,500
Total Costs	**$ 295,000**	**$73,750**	**$73,750**	**$442,500**
Total Including Permitting[3] Costs				**$507,500**

Notes:

1 – Capital cost does not include the acquisition (if necessary) of easements.

2 – Contingency and Engineering & Legal costs were each estimated as 25% of capital costs. Permitting costs are included elsewhere.

3 – Permitting costs (estimated at $65,000 per CSO) include wetland delineation and plant survey, PADEP Section 105 O&E Permit, PHMC Search, Amending existing NPDES permit, Fisheries Survey, Herpetological Survey, Agency Coordination, PADEP Environmental Assessment, Wetland Mitigation plan and oversight, Wetland Monitoring, PA CZ Consistency Determination

In addition, the per unit cost for potential improvements to each of Outfall Nos. 3, 4, 5, and 6 was estimated for typical improvements being considered by DELCORA. These typical improvements include the following:

- One new manhole at the existing outfall;
- Replacement of approximately 125 feet of existing 36- or 48-inch ductile iron pipe and extension of the outfall approximately 75 feet into the Delaware River (total of 200 LF);
- Three new 72-inch manholes, including one at the existing outfall; and
- Outfall pilings.

Estimated per unit costs based on these assumptions are summarized in Table 5-2B.

Table 5-2B

Rivertown CSO Improvements Cost Estimate – Unit Cost for No. 3, 4, 5, 6

Description	Capital Cost[1]	Contingency[2]	Engineering & Legal Costs[2]	Total Cost
200 LF of 36- or 48-inch DIP	$80,000	$20,000	$20,000	$120,000
3 New 72-inch Manhole	$30,000	$7,500	$7,500	$45,000
Outfall Piling	$45,000	$11,250	$11,250	$67,500
Total Costs	**$155,000**	**$38,750**	**$38,750**	**$232,500**
Total Including Permitting[3] Costs				**$297,500**

Notes:

1 – Capital cost does not include the acquisition (if necessary) of easements.

2 – Contingency and Engineering & Legal costs were each estimated as 25% of capital costs. Permitting costs are included elsewhere.

3 – Permitting costs (estimated at $65,000 per CSO) include wetland delineation and plant survey, PADEP Section 105 O&E Permit, PHMC Search, Amending existing NPDES permit, Fisheries Survey, Herpetological Survey, Agency Coordination, PADEP Environmental Assessment, Wetland Mitigation plan and oversight, Wetland Monitoring, PA CZ Consistency Determination

These costs are based on an assumed length of pipe replacement. However, the condition of the existing pipe is unknown with the exception of Highland Street (No. 3) and will have to be determined on a case by case basis. In addition, it is assumed that no contaminated soil will have to be removed and disposed.

Estimated total costs for improvements to all potentially affected Rivertown CSO Outfalls (Nos. 3, 4, 5, 6, and 7) are summarized in Table 5-2C.

Table 5-2C

Rivertown CSO Improvements Cost Estimate – Total for 5 Outfalls (No. 3, 4, 5, 6, 7)

Description	Capital Cost[1]	Contingency[2]	Engineering & Legal Costs[2]	Total Cost
1,350 LF of 36- and 48-inch DIP	$540,000	$135,000	$135,000	$810,000
15 New 72-inch Manholes	$150,000	$37,500	$37,500	$225,000
Outfall Piling	$225,000	$56,250	$56,250	$337,500
Total Costs	**$915,000**	**$228,750**	**$228,750**	**$1,372,500**
Total Including Permitting[3] Costs				**$1,697,500**

Notes:

1 – Capital cost does not include the acquisition (if necessary) of easements.

2 – Contingency and Engineering & Legal costs were each estimated as 25% of capital costs. Permitting costs are included elsewhere.

3 – Permitting costs (estimated at $65,000 per CSO) include wetland delineation and plant survey, PADEP Section 105 O&E Permit, PHMC Search, Amending existing NPDES permit, Fisheries Survey, Herpetological Survey, Agency Coordination, PADEP Environmental Assessment, Wetland Mitigation plan and oversight, Wetland Monitoring, PA CZ Consistency Determination

Estimated total costs for improvements to all potentially affected Rivertown CSO Outfalls (Nos. 3, 4, 5, 6, and 7), as well as the two potentially affected Riverbridge CSO Outfalls (Nos. 9 and 11) are summarized in Table 5-2D. Note that improvements to No. 9 (Lloyd Street) are assumed to be similar to Nos. 3, 4, 5, and 6 and a cost estimate for this outfall is based on the unit cost shown in Table 5-2B. The estimated cost for improvements to No. 11 (Parker Street) is based on an evaluation performed previously, and includes the following:

- Replacement of 1,000 LF of 48-inch DIP pipe, and extension of the outfall approximately 75 feet into the Delaware River (total of 1,075 LF);
- Installation of 4 new 72-inch diameter manholes;
- 1 railroad crossing;
- Removal and disposal of 5,800 cubic yards (cy) of contaminated soil; and
- Outfall piling.

The sum of the estimated costs for the above noted improvements are shown below.

Table 5-2D

Rivertown CSO Improvements Cost Estimate – Total for 7 Outfalls (No. 3, 4, 5, 6, 7, 9, 11)

Description	Capital Cost[1]	Contingency[2]	Engineering & Legal Costs[2]	Total Cost
2,625 LF of 36- and 48-inch DIP	$1,050,000	$262,500	$262,500	$1,575,000
22 New 72-inch Manholes	$220,000	$55,000	$55,000	$330,000
75 LF Railroad Crossing (No. 11)	$74,000	$18,500	$18,500	$111,000
Disposal of 5,800 cy of Contaminated Soil (No. 11)	$0	$0	$1,300,000	$1,300,000
Outfall Piling	$315,000	$78,750	$78,750	$472,500
Total Costs	**$1,659,000**	**$414,750**	**$1,714,750**	**$3,788,500**
Total Including Permitting[3] Costs				**$4,243,500**

Notes:

1 – Capital cost does not include the acquisition (if necessary) of easements.

2 – Contingency and Engineering & Legal costs were each estimated as 25% of capital costs. Permitting costs are included elsewhere.

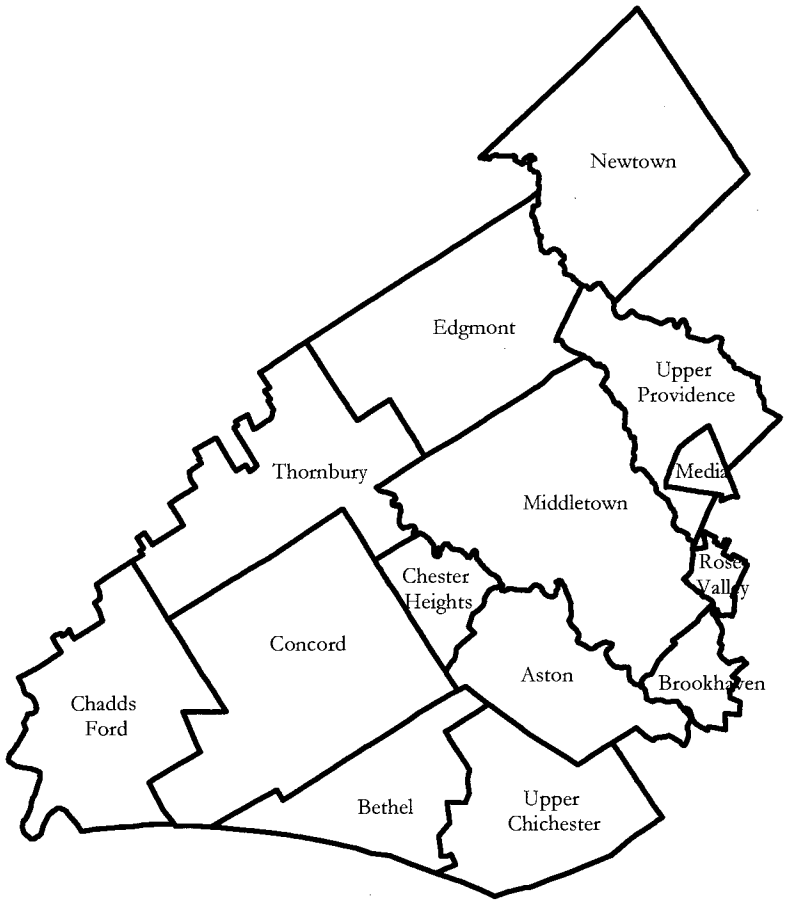
3 – Permitting costs (estimated at $65,000 per CSO) include wetland delineation and plant survey, PADEP Section 105 O&E Permit, PHMC Search, Amending existing NPDES permit, Fisheries Survey, Herpetological Survey, Agency Coordination, PADEP Environmental Assessment, Wetland Mitigation plan and oversight, Wetland Monitoring, PA CZ Consistency Determination

For all of the above CSO improvement budgetary planning cost estimates, permitting costs are based on typical requirements, and assume that efficiencies and cost savings can be achieved by permitting multiple CSOs concurrently.

DELAWARE COUNTY

ACT 537 SEWAGE FACILITIES PLAN REVISION

WESTERN PLAN OF STUDY



DELAWARE COUNTY PLANNING DEPARTMENT
and
DELAWARE COUNTY REGIONAL WATER QUALITY CONTROL AUTHORITY

2004

DELAWARE COUNTY

ACT 537 SEWAGE FACILITIES PLAN REVISION

2004

WESTERN PLAN OF STUDY

Prepared for
Delaware County Planning Department
and
Delaware County Regional Water Quality Control Authority

with assistance from
Weston Solutions, Inc.

Mailing Address
Court House/Government Center
201 West Front Street
Media, PA 19063

Office Location
Toal Building
2nd & Orange Streets
Media, PA 19063

Telephone: (610) 891-5200 Fax: (610) 891-5203
e-mail: planning_department@co.delaware.pa.us

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CHAPTER 1

DESCRIPTION OF THE STUDY AREA

GENERAL

Delaware County is located in the southeastern corner of the Commonwealth of Pennsylvania. The County is bounded on the east by the City of Philadelphia, on the southeast by the Delaware River and the State of New Jersey, and on the southwest by the State of Delaware. Figure 1-1 shows Delaware County in its regional setting. Although the County is the third smallest in the state in terms of land area (184.43 square miles), it has the fifth largest population (550,864) according to the Census 2000. Of the 49 municipalities comprising the County, nineteen have areas of less than one square mile, and eleven others do not exceed two square miles (see Figure 1-2).

Environment

Two major topographical areas run through the County. The eastern section of Delaware County is quite level and lies in the Atlantic Coastal Plain. This is an area of low, flat, poorly drained land which extends from the Marcus Hook area northeastward on a line almost paralleling U.S. Route 13 between MacDade Boulevard and Chester Pike into the Yeadon area and south to the Delaware River. Much of this land has been improved for industrial and commercial use because of its proximity to the Delaware River.

The western portion of the County is extremely hilly. This area lies north and west of the Coastal Plain and covers the remaining area of the County. It is the beginning of the Piedmont Province, which extends sixty to eighty miles inland from the Coastal Plain. This area includes rolling or undulating uplands, low hills, and well-drained soils. These features give the County its rolling surface, which ranges from a height of 480 feet (in Marple Township) to sea level (at the Delaware River).

Although all of the land in Delaware County is part of the Delaware River watershed, the County is also divided into eight major subwatersheds which correspond to the County's major streams (see Figure 1-3). The County has many small lakes and farm ponds, as well as the much larger Springton Reservoir, which is located between Marple and Upper Providence Townships.

Governmental Structure

Delaware County is a second class A county with a home rule charter. It is governed by a Council of five members, each of whom is elected to a staggered four-year term.

The County's 49 municipalities include one city of the third class, twelve first class townships, nine second class townships, and twenty-seven boroughs (see Table 1-1). Seven of the County's municipalities are governed by home rule charters.

Chester is a city of the third class. Under powers granted by the Home Rule Charter Amendment of 1957, Chester has adopted a Mayor-Council form of government with the number of councilmen set at four.

All first class townships not governed by home rule are regulated by the First Class Township Code, which requires government by an elected Board of Commissioners. The number of members on the board can vary from five to fifteen members, depending on the political subdivision of the township.

All second class townships not governed by home rule are regulated by the Second Class Township Code, which requires government by an elected Board of Supervisors. The board is composed of either three or five members, depending on the population of the township.

All boroughs not governed by home rule are regulated by the Borough Code, which requires government by a Mayor and Borough Council. The number of councilmen is dependent on the number of political subdivisions of the borough, but cannot exceed fifteen.

Those municipalities governed by a home rule charter (except for the City of Chester) were granted this option by the Home Rule Charter and Option Plans Law of 1972. This law gives every Pennsylvania municipality the opportunity to either draft a home rule charter or to select an optional plan of government. Delaware County home rule municipalities generally have a Council form of government. In these municipalities, the Council form of government is dependent upon and regulated by the charter and generally consists of one councilman from each political subdivision of the municipality but may also include councilmen at large.

Economic Characteristics

Historically, Delaware County's economic development has been based on its readily available supplies of water for power and process needs, for transportation, and for the removal of wastes. Heavy industry came to Delaware County to take advantage of the many swift streams that empty into the Delaware River. A belt of heavy industry developed along the river from the State of Delaware into Philadelphia. This belt includes the City of Chester, Tinicum and Ridley Townships, and the Boroughs of Eddystone, Marcus Hook, and Trainer.

With the advent of good road systems and abundant power, industry began to decentralize. Delaware County has experienced a shift in employment character in the

Insert Figure 1-1

Insert Figure 1-2

Insert Figure 1-3

TABLE 1-1

GOVERNMENTAL STRUCTURE OF MUNICIPALITIES IN DELAWARE COUNTY

Third Class City	Number of Councilmen	Form of Government
Chester	4	Home Rule

First Class Townships	Number of Commissioners	Form of Government
Aston	7	
Darby	5	Home Rule
Haverford	9	
Lower Chichester	5	
Marple	7	
Nether Providence	6	
Radnor	7	Home Rule
Ridley	9	
Springfield	7	
Tinicum	5	
Upper Chichester	5	
Upper Darby	11	Home Rule

Second Class Townships	Number of Supervisors	Form of Government
Bethel	3	
Chadds Ford	3	
Chester	5	Home Rule
Concord	5	
Edgmont	3	
Middletown	7	Home Rule
Newtown	5	
Thornbury	3	
Upper Providence	5	Home Rule

Boroughs	Number of Councilmen	Form of Government
Aldan	7	
Brookhaven	7	
Chester Heights	7	
Clifton Heights	8	
Collingdale	7	
Colwyn	7	
Darby	9	
East Lansdowne	7	
Eddystone	7	
Folcroft	7	
Glenolden	7	
Lansdowne	7	
Marcus Hook	7	
Media	7	
Millbourne	5	
Morton	7	
Norwood	7	
Parkside	7	
Prospect Park	7	
Ridley Park	7	
Rose Valley	7	
Rutledge	7	
Sharon Hill	7	
Swarthmore	7	
Trainer	7	
Upland	7	
Yeadon	7	

Source: DCPD, 1999

last two decades from one that was dominated by industrial/manufacturing employment to one that has become more service oriented.

Commerce in Delaware County has developed in a linear pattern along the radial highways feeding into Philadelphia, at the City of Chester, at the 69th Street Terminal area in Upper Darby Township, and at Media Borough, the County seat. The most recent area of commercial growth is in the vicinity of U.S. Routes 1 and 202 along the Chadds Ford and Concord Township border. An additional area experiencing a high rate of growth is in the vicinity of U.S. Route 322 in Upper Chichester Township. Although there are several large shopping centers in the County, most commercial development to date has been uncoordinated strip development along the radial highways. The prime influence for this development has been, and continues to be, the automobile.

Recent Trends in County Development

Although specific trends in County development will be discussed in a later chapter, recent development trends indicate that areas from Middletown Township west to the Chester County border are developing most quickly, with 7,334 residential building permits issued between 1988 and 1998 alone. Areas experiencing the greatest level of new development include Aston, Bethel, Concord, and Upper Chichester Townships. A more in-depth discussion of demographics is presented in Chapter 2.

U.S. Route 30 in Radnor Township, PA Route 3 in Marple Township, U.S. Route 1 in Nether Providence, and MacDade Boulevard in Ridley Township have also seen a major increase in development activity since the completion of the Mid-County Expressway, I-476 (Blue Route) in December 1992.

PLANNING AND COORDINATION

Regional Planning and Coordination

Delaware County is a member government of the Delaware Valley Regional Planning Commission (DVRPC). In 1965, DVRPC was established to coordinate planning and development for the Delaware Valley regional area. DVRPC is concerned with regional planning and coordination of land use, transportation, housing, and to a lesser degree, the environment. It is composed of Chester, Bucks, Delaware, Montgomery, and Philadelphia Counties and the City of Chester in Pennsylvania and Burlington, Camden, Gloucester, and Mercer Counties and the Cities of Trenton and Camden in New Jersey.

The Delaware River Basin Commission (DRBC) also exercises authority with regard to all projects having a substantial effect on the water resources of the Delaware River basin. The U.S. Army Corps of Engineers has jurisdiction over construction along and discharges into navigable waterways. The U.S. Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (DEP) are

responsible for air and water quality regulation. DEP is specifically responsible for the enforcement of regulations adopted pursuant to Act 537.

Delaware County is also served by a County Conservation District, which has been delegated responsibility for overseeing the State's erosion control regulations under Chapter 102 and general permitting under Chapter 105 for stream and wetland permits. The Conservation District also works on problems of soil use and conservation, runoff, and the protection and proper use of Delaware County's water resources.

County Planning and Coordination

Planning within the County exists on two levels. The Delaware County Planning Commission (DCPC) and Department (DCPD) serve in an advisory capacity to the County's 49 municipalities. The Pennsylvania Municipalities Planning Code (MPC), Act 247, as amended, grants municipalities the power to prepare and enact a comprehensive plan, a zoning ordinance, and a subdivision and land development ordinance to guide their development. As of 1999, all 49 municipalities had prepared a comprehensive plan, and some had already updated their plan or were in the process of doing so. All 49 municipalities have zoning ordinances, and thirty have local subdivision and land development ordinances. The remaining nineteen municipalities utilize the Delaware County Subdivision and Land Development Ordinance, as amended, either by adoption or by virtue of the fact that they lack a local ordinance.

As of 2000, Delaware County did not have an adopted comprehensive plan. In 1976, the *Delaware County Land Use Plan 2000* was developed; however, it was never officially adopted by County Council. On July 18, 1978, the County adopted the Policies and Recommendations section and the Park and Recreation Facilities Improvements Plan map contained in the *Delaware County Open Space, Parks, and Recreation Study*, which was considered for adoption as part of the County's comprehensive plan but was never officially adopted.

The County is currently in the process of preparing a plan for adoption as the official County comprehensive plan, as provided for under the MPC. Several specific elements, including this sewage facilities plan component, are in the development stage. Until that plan is completed, the *Delaware County Land Use Plan 2000* is still the basic source of information on the future development of the County. This plan, which was published in January 1976, was based on economic and population trend data available at the time. This plan was an important element in the regional plan for the year 2000 adopted as part of the regional development guide by DVRPC in 1978.

It is expected that the new comprehensive plan, which will be officially adopted, will re-examine existing and potential future development cores, activity centers, and developing residential areas. It will also take a close look at balancing new development in less densely populated areas with opportunities for redevelopment of existing urbanized areas in light of recent trends and infrastructure changes.

Sewage Facilities Coordination

The Pennsylvania Sewage Facilities Act of 1966 (as amended), more commonly referred to as Act 537, is the primary legislation governing sewage facilities planning and regulation. The Act requires municipalities to submit, either individually or jointly, Official Sewage Facilities Plans to DEP. These plans are to contain information concerning existing and future needs of each municipality, as well as alternatives for providing adequate wastewater facilities to serve the needs of the municipality into the future. The Act also calls for municipalities to periodically revise their Act 537 plans as conditions change or as the need arises. As illustrated in Table 1-2, when the County's Act 537 plan revision (update) was conceived, only eleven (22.4%) municipalities in Delaware County had prepared individual Act 537 plans. The remaining thirty-eight municipalities still recognized the County's Act 537 sewage facilities plan prepared in 1971 as their official plan.

Typically, counties have only an advisory role in sewage facilities planning. DEP requires them to review and provide comments on municipal Act 537 base plans and their revisions. It also requires them to review sewage facilities planning modules for new subdivisions and land developments. However, several years ago it became apparent that the developed portions of the County (the thirty-eight sewered municipalities still utilizing the County's 1971 plan) were experiencing infrastructure problems. As a result, the Delaware County Regional Water Quality Control Authority (DELCORA) suggested to DCPD that a plan update to address these problems might be in order. At the same time it also became clear that the developing municipalities were each preparing separate Act 537 plans that did not take into account the potential for shared systems. Therefore, DCPD volunteered to undertake a Countywide sewage facilities plan on the municipalities' behalf. The eastern portion of the plan was completed in 2002, with all thirty-five municipalities adopting the plan as their own the same year and DEP approving the plan in 2003.

In addition to providing legislation for sewage facilities planning, Act 537 requires permits to be issued for the construction, installation, or alteration of individual and community wastewater systems. Rules and regulations regarding community and individual systems are developed by DEP and adopted by the State Environmental Quality Board. A State Board of Certification of Sewage Enforcement Officers administers the State's sewage enforcement officer (SEO) certification program. The rules and regulations promulgated by DEP in accordance with the Pennsylvania Sewage Facilities Act are contained within Chapters 71, 72, and 73 of DEP's Title 25: Rules and Regulations. The following list briefly summarizes the provisions of these chapters:

Chapter 71: Administration of Sewage Facilities Program

This program provides a comprehensive sewage planning mechanism to identify and resolve existing sewage disposal problems, to avoid potential sewage

problems resulting from new land development, and to provide for the future sewage disposal needs of a municipality.

TABLE 1-2

LOCAL AND COUNTY ACT 537 PLANS[1]

Municipality	Municipality
Use Municipal Act 537 Sewage Facilities Plan	
Aston Township	Middletown Township[2]
Bethel Township[2]	Newtown Township[2]
Brookhaven Borough[2]	Thornbury Township[2]
Chadds Ford Township[2]	Upper Chichester Township[2]
Chester Heights Borough[2]	Upper Providence Township[2]
Concord Township[2, 3]	
Use County's 1971 Sewage Facilities Plan	
Aldan Borough	Millbourne Borough
Chester City	Morton Borough
Chester Township	Nether Providence Township[2]
Clifton Heights Borough	Norwood Borough[2]
Collingdale Borough	Parkside Borough
Colwyn Borough[2]	Prospect Park Borough
Darby Borough	Radnor Township[2]
Darby Township	Ridley Township
East Lansdowne Borough[2]	Ridley Park Borough
Eddystone Borough	Rose Valley Borough
Edgmont Township[2]	Rutledge Borough
Folcroft Borough	Sharon Hill Borough
Glenolden Borough	Springfield Township
Haverford Township[2]	Swarthmore Borough
Lansdowne Borough	Tinicum Township
Lower Chichester Township	Trainer Borough
Marcus Hook Borough	Upland Borough
Marple Township[2]	Upper Darby Township
Media Borough[2]	Yeadon Borough[2]

Source: DCPD, 1999

Notes:

[1] As of 1988, not including Act 537 revisions, amendments, and special studies.

[2] Sewage Enforcement Officer (SEO) responsible for local enforcement of Act 537.

[3] Southwest Delaware County Municipal Authority Plan

Chapter 72: Administration of Sewage Facilities Permitting Program

This program establishes requirements for permitting associated with installation of individual and community on-lot wastewater disposal systems and regulates the administration of permitting functions by local agencies and SEOs.

Chapter 73: Standards for Sewage Disposal Facilities

This program establishes requirements for the design, location, and construction of sewage facilities. It is administered locally by the municipal SEO.

In Delaware County, Act 537 regulations are administered at a local level with advisory comments provided by DCPD. SEOs are responsible for local enforcement of Act 537 in twenty-one of the County's municipalities. The remaining municipalities, located mostly in eastern Delaware County, are served by public sewers; therefore, sewage facilities planning and regulatory functions are performed by a municipal engineer or a code enforcement officer.

Sewer Authorities

There are twenty sewer authorities serving various areas in Delaware County. The service areas associated with these authorities generally correspond to designated public sewered areas within one municipality. However, in areas such as eastern Delaware County, the sewer authority boundaries tend to follow watershed boundaries and, therefore, most often include more than one municipality. A list of sewer authorities and associated municipalities is presented in Table 1-3. Figure 1-4 provides a visual representation of the sewer authority boundaries in the western planning area. Sewer authorities are responsible for carrying out planning and are authorized to finance, construct, and operate public sewer facilities within their designated service areas.

Delaware County Regional Water Quality Control Authority

DELCORA was created in 1971 by ordinance of the Delaware County Commissioners with the purpose of implementing the Official Sewage Facilities Plan. It was authorized to finance, construct, operate, and maintain interceptor systems, pumping stations, and treatment plants in the County with the exception of the Upper Darby-Haverford system (the area currently served by the City of Philadelphia) and the Southern Delaware County Authority (SDCA) system.

In one way or another, DELCORA serves most of eastern Delaware County and the communities along the Delaware River except Tinicum Township. Generally speaking, most of the sewage from the Darby, Crum, and Muckinipates watersheds (DELCORA's Eastern Service Area) currently passes through DELCORA's pump stations and force main to the City of Philadelphia Southwest Water Pollution Control

TABLE 1-3

SEWER AUTHORITIES AND MEMBER MUNICIPALITIES

DELAWARE COUNTY EASTERN PLANNING AREA

DELCORA EAST (C)

Muckinipates Sewer Authority (C)
- Aldan Borough
- Clifton Heights Borough
- Darby Township
- Folcroft Borough
- Glenolden Borough
- Norwood Borough
- Ridley Township
- Sharon Hill Borough
- Springfield Township
- Upper Darby Township

Central Delaware County Authority (C)
- Eddystone Borough
- Marple Township
- Morton Borough
- Nether Providence Township
- Norwood Borough
- Prospect Park Borough
- Ridley Park Borough
- Ridley Township
- Rutledge Borough
- Springfield Township
- Swarthmore Borough

Darby Creek Joint Authority (C)
- Aldan Borough
- Clifton Heights Borough
- Collingdale Borough
- Colwyn Borough
- Darby Borough
- Darby Township
- Folcroft Borough
- Lansdowne Borough
- Sharon Hill Borough
- Springfield Township
- Upper Darby Township
- Yeadon Borough

Radnor Haverford Marple Sewer Authority (C)
- Haverford Township
- Marple Township
- Newtown Township
- Radnor Township
- Tredyffrin Township (Chester County)

DELCORA WEST (T,C)
- Brookhaven Borough
- Chester City
- Chester Township
- Lower Chichester Township
- Marcus Hook Borough
- Parkside Borough
- Rose Valley Borough
- Trainer Borough
- Upland Borough

TINICUM TOWNSHIP SEWER AUTHORITY (T,C)
- Tinicum Township

CITY OF PHILADELPHIA WATER DEPARTMENT (T,C)
- East Lansdowne Borough
- Haverford Township
- Millbourne Borough
- Upper Darby Township
- Yeadon Borough

TABLE 1-3

SEWER AUTHORITIES AND MEMBER MUNICIPALITIES (CONTINUED)

DELAWARE COUNTY WESTERN PLANNING AREA	
SOUTHWEST DELAWARE COUNTY MUNICIPAL AUTHORITY (T,C) Aston Township Brookhaven Borough Chester Township Chester Heights Borough Concord Township Upper Chichester Township Upper Providence Township **Middletown Township Sewer Authority**(C) Middletown Township Upper Providence Township	**THORNBURY TOWNSHIP BOARD OF SUPERVISORS** (T,C) Thornbury Township **CHADDS FORD TOWNSHIP SEWER AUTHORITY** (T,C) Chadds Ford Township
DELAWARE COUNTY REGIONAL WATER QUALITY CONTROL AUTHORITY (T) **Southern Delaware County Authority**(C) Upper Chichester Township **Bethel Township Sewer Authority** (C) Bethel Township	**CITY OF WILMINGTON** (T,C) **Bethel Township Sewer Authority** (C) Bethel Township
AQUA PENNSYLVANIA, INC. (T,C) Media Borough **Upper Providence Sewer Authority** (C) Upper Providence Township	**CONCORD TOWNSHIP SEWER AUTHORITY** (T,C) Concord Township
ROSE VALLEY SEWER AUTHORITY (T,C) Nether Providence Township Rose Valley Borough	**NEWTOWN TOWNSHIP MUNICIPAL SEWER AUTHORITY** (C) Newtown Township
BROOKHAVEN SEWER AUTHORITY (T,C) Brookhaven Borough	

Source: DCPD, 2003
KEY: C - Conveyance Authority
T - Treatment Authority
Note: Some municipalities lie within more than one Authority's jurisdiction.

Insert Figure 1-4

Plant (PSWPCP). DELCORA's 44 million gallon/day (MGD) Western Regional Wastewater Treatment Plant (WRTP) in the City of Chester serves most of the waterfront areas (DELCORA's Western Service Area). Long-range plans developed in the early 1970s to tie the western portion of the County into the same regional system have not been implemented.

DELCORA provides wastewater disposal services for the following sewer authorities in its Eastern Service Area: Radnor-Haverford-Marple (RHM), Darby Creek Joint Authority (DCJA), Central Delaware County Authority (CDCA), and the Muckinipates Sewer Authority. Wastewater from these sewer authorities is conveyed by DELCORA to the PSWPCP. The Central Delaware County Pump Station Diversion Project allows for the redirection of flow from the CDCA sewershed to DELCORA's WRTP.

DELCORA's Western Service Area includes Upper Chichester, Lower Chichester, and Chester Townships, Marcus Hook, Trainer, Upland, Parkside, and Eddystone Boroughs, the City of Chester, and the southern portion of Brookhaven Borough. Flows from this service area are conveyed to DELCORA's WRTP in the City of Chester.

REPORT FORMAT: EASTERN AND WESTERN DELAWARE COUNTY

As will be noted in this report, the eastern and western portions of the County are significantly different in terms of sewer planning needs. The primary criterion used in dividing the County into the eastern and western areas was the percentage of the municipality not served by public sewers, as determined by a preliminary survey of SEOs in 1989. The ten municipalities identified with substantial unsewered areas at that time included Newtown, Edgmont, Upper Providence, Middletown, Thornbury, Aston, Chadds Ford (previously Birmingham), Concord, and Bethel Townships and Chester Heights Borough. Upper Chichester Township and Media, Rose Valley, and Brookhaven Boroughs, which are almost entirely sewered, were added to this group because they adjoin unsewered municipalities and either operate sewage treatment plants or serve as a direct link to a sewage treatment system (i.e., New Castle County/City of Wilmington). While we recognize that sewer service has expanded or been extended to several areas within the designated western portion of the County in recent years, for planning purposes, we still feel that the original delineation (growth areas vs. developed areas) is appropriate today. Refer to Table 1-4 and Figure 1-5 for the east/west delineation used for planning purposes.

The eastern half of the County, with the exception of several northern municipalities such as Haverford and Radnor, can be considered developed and serviced with public sewers. Therefore, evaluation and recommendations for corrective action to existing sewer infrastructure (such as repair or replacement of existing sewer lines and repair, expansion, or phase out of poorly operating sewer treatment plants) were considered likely issues to be addressed at the onset of this study.

TABLE 1-4

EASTERN/WESTERN DESIGNATION

EASTERN MUNICIPALITIES	
DELCORA's Eastern Service Area	**DELCORA's Western Service Area**
Aldan Borough	Chester City
Clifton Heights Borough	Chester Township
Collingdale Borough	Eddystone Borough
Colwyn Borough	Lower Chichester Township
Darby Borough	Marcus Hook Borough
Darby Township	Parkside Borough
East Lansdowne Borough	Trainer Borough
Folcroft Borough	Upland Borough
Glenolden Borough	
Haverford Township	**City of Philadelphia**
Lansdowne Borough	East Lansdowne Borough
Marple Township	Haverford Township
Millbourne Borough	Millbourne Borough
Morton Borough	Upper Darby Township
Nether Providence Township	Yeadon Borough
Norwood Borough	
Prospect Park Borough	
Radnor Township	
Ridley Township	
Ridley Park Borough	
Rutledge Borough	
Sharon Hill Borough	
Springfield Township	
Swarthmore Borough	
Tinicum Township	
Upper Darby Township	
Yeadon Borough	
WESTERN MUNICIPALITIES	
Aston Township	Media Borough
Bethel Township	Middletown Township
Brookhaven Borough	Newtown Township
Chadds Ford Township	Rose Valley Borough
Chester Heights Borough	Thornbury Township
Concord Township	Upper Chichester Township
Edgmont Township	Upper Providence Township

Source: DCPD, 1999

Insert Figure 1-5

In contrast, portions of central and most of western Delaware County (with the exception of older municipalities bordering the Delaware River) remained semi-rural until about twenty-five years ago. In recent years, as the County population began to shift northward and westward, many of these areas have been experiencing tremendous growth pressure. This trend is clearly demonstrated in the demographic characteristics presented in Chapter 2.

As a result of the significant differences between the sewer needs of "developed" vs. "developing" municipalities, planning for each of the respective portions of the County will be performed separately. While the same items will be addressed for both portions of the County, emphasis is placed on different elements of the plan in each area. Alternatives and recommendations for each half of the County will also be assessed separately and will appear in two separate reports.

The evaluation of the eastern area places emphasis on the condition and capacity of the existing sewer systems. Between 1996 and 1997, a series of inflow and infiltration (I&I) studies were conducted in the twenty-four municipalities and three municipal authorities in the eastern portion of the County. These studies were performed to determine the extent of I&I in each municipality. The studies were ultimately used to provide technical data for recommendations supporting the need for corrective action and related costs.

Evaluation of sewage facilities in the western area targets communities experiencing a high degree of growth pressure or communities that continue to have a significant number of on-site systems. Generally speaking, these are also communities that operate or are served by sewage treatment plants that are not part of the DELCORA regional system. Detailed population projections, soils analysis, and independent evaluation of existing community systems are addressed to identify problem areas, determine the need for corrective action, and recommend wastewater disposal alternatives. The following is an evaluation of the western area.

CHAPTER 2

DEMOGRAPHIC CHARACTERISTICS OF THE STUDY AREA

INTRODUCTION

When assessing an area's sewerage needs, there are several factors that should be considered. One of the most important of these is the area's population because the number of people living and working in an area determines how much wastewater will be generated. Population along with other relevant factors such as soil conditions, geology, and land use activities can be collectively analyzed in order to provide a basis for sound decision-making and the development of specific sewage treatment alternatives for specific areas.

This chapter presents the current and projected population data for Delaware County. The information in this chapter was instrumental during the evaluation process and weighed heavily in formulating recommendations for future sewage facilities in the plan for the western portion of the County.

EXISTING POPULATION

Current Population in Perspective

The U. S. Department of Commerce, Bureau of the Census (Census Bureau) reports indicate that as of 2000, Delaware County had a population of 550,864 residents within the boundaries of its 49 municipalities. The majority (33) of the municipalities had populations under 10,000, and slightly more than half of those populations were under 5,000. There were only seven municipalities with a substantial number of residents. Upper Darby Township had the largest population with 81,821. Upper Darby was followed by Haverford Township (48,498) and Chester City (36,854), with Marple, Radnor, Ridley, and Springfield Townships having populations over 20,000. The remaining municipalities had populations ranging from 860 in Rutledge Borough to 16,842 in Upper Chichester Township.

Significant growth and development has taken place in the County since the 1990 Census, particularly in the rapidly developing western municipalities. While the County's overall population rose from 547,651 in 1990 to 550,864 in 2000, the most significant population change was in population distribution from east to west. The eastern portion of the County lost 16.8% of its population while the western portion of the County had a 37.9% population increase. Refer to Table 2-1 for the most recent census information.

Growth Rate History

Through the post-Korean War era (1950s), the eastern portion of the County experienced significant growth as a result of industrial expansion. During this time

TABLE 2-1

DELAWARE COUNTY POPULATION, 1970 – 2000

Eastern Municipalities					
Municipality	**1970**	**1980**	**1990**	**2000**	**% Change 1970 - 2000**
Aldan Borough	5,001	4,671	4,549	4,313	-13.8%
Chester City	56,331	45,794	41,856	36,854	-34.6%
Chester Township	5,708	5,687	5,399	4,604	-19.3%
Clifton Heights Borough	8,348	7,320	7,111	6,779	-18.8%
Collingdale Borough	10,605	9,539	9,175	8,664	-18.3%
Colwyn Borough	3,169	2,851	2,613	2,453	-22.6%
Darby Borough	13,729	11,513	11,140	10,299	-25.0%
Darby Township	13,603	12,264	10,955	9,622	-29.3%
East Lansdowne Borough	3,186	2,806	2,691	2,586	-18.8%
Eddystone Borough	2,706	2,555	2,446	2,442	-9.8%
Folcroft Borough	9,610	8,231	7,506	6,978	-27.4%
Glenolden Borough	8,697	7,633	7,260	7,476	-14.0%
Haverford Township	56,873	52,349	49,848	48,498	-14.7%
Lansdowne Borough	14,090	11,891	11,712	11,044	-21.6%
Lower Chichester Township	4,009	3,784	3,660	3,591	-10.4%
Marcus Hook Borough	3,041	2,638	2,546	2,314	-23.9%
Marple Township	25,040	23,642	23,123	23,737	-5.2%
Millbourne Borough	637	652	831	943	48.0%
Morton Borough	2,602	2,412	2,851	2,715	4.3%
Nether Providence Township	13,589	12,730	13,229	13,456	-1.0%
Norwood Borough	7,229	6,647	6,162	5,985	-17.2%
Parkside Borough	2,343	2,464	2,369	2,267	-3.2%
Prospect Park Borough	7,250	6,593	6,764	6,594	-9.0%
Radnor Township	28,782	27,676	28,703	30,878	7.3%
Ridley Township	39,085	33,771	31,169	30,791	-21.2%
Ridley Park Borough	9,025	7,889	7,592	7,196	-20.3%
Rutledge Borough	1,167	934	843	860	-26.3%
Sharon Hill Borough	7,464	6,221	5,771	5,468	-26.7%
Springfield Township	29,006	25,326	24,160	23,677	-18.4%
Swarthmore Borough	6,156	5,950	6,157	6,170	0.2%
Tinicum Township	4,906	4,291	4,440	4,353	-11.3%
Trainer Borough	2,336	2,056	2,271	1,901	-18.6%
Upland Borough	3,930	3,458	3,334	2,977	-24.2%
Upper Darby Township	95,910	84,054	81,177	81,821	-14.7%
Yeadon Borough	12,136	11,727	11,980	11,762	-3.1%
Eastern Municipalities	**519,269**	**461,999**	**443,393**	**432,068**	**-16.8%**

TABLE 2-1

DELAWARE COUNTY POPULATION, 1970 – 2000 (CONTINUED)

Western Municipalities					
Municipality	**1970**	**1980**	**1990**	**2000**	**% Change 1970 - 2000**
Aston Township	13,704	14,530	15,080	16,203	18.2%
Bethel Township	2,034	2,438	3,330	6,421	215.7%
Brookhaven Borough	7,370	7,912	8,567	7,985	8.3%
Chadds Ford Township	1,281	2,057	3,118	3,170	147.5%
Chester Heights Borough	597	1,302	2,273	2,481	315.6%
Concord Township[1]	4,592	6,437	6,933	11,239	116.3%
Edgmont Township	1,368	1,410	2,735	3,918	186.4%
Media Borough	6,444	6,119	5,957	5,533	-14.1%
Middletown Township	12,878	12,463	14,130	16,064	24.7%
Newtown Township	11,081	11,775	11,366	11,700	5.6%
Rose Valley Borough	876	1,038	982	944	7.8%
Thornbury Township[1,2]	3,284	3,653	4,728	5,787	116.0%
Upper Chichester Township	11,414	14,377	15,004	16,842	47.6%
Upper Providence Township	9,234	9,477	9,727	10,509	13.8%
Western Municipalities	**86,157**	**94,988**	**103,930**	**118,796**	**37.9%**
Delaware County	**603,456**	**555,007**	**547,651**	**550,864**	**-8.7%**

Source: U.S. Department of Commerce, Bureau of the Census, prepared by DCPD, 2001

[1] In Concord and Thornbury Townships, the 2000 population figures of 9,933 and 7,093 were revised by the Census Bureau to 11,239 and 5,787 pursuant to municipal challenge.

[2] Thornbury's 1990 population, as revised by the Census Bureau in 1994, was 4,728, not 5,056 which DVRPC used in its 2025 forecast.

period, the area prospered, jobs were abundant, and the population grew. During this same period, the western portions of the County remained largely rural/agricultural.

Over the last few decades, the total population of Delaware County has exhibited a decline in numbers similar to that of many other manufacturing-dependent urban areas in the United States. Table 2-1, showing the census figures from 1970, 1980, 1990, and 2000, illustrates that although there had been a gradual yet steady decline in total population for three consecutive decades, the Census 2000 actually showed an increase in population.

The eastern municipalities have consistently exhibited a decrease in population, while the western municipalities have experienced significant growth. This shift can be attributed to a number of factors, some of which include the change from a manufacturing to a service economy (1970s) and the migration of people from urban areas like Chester City and Upper Darby to more suburban settings such as Chester Heights Borough and Bethel, Concord, Edgmont, and Thornbury Townships in the western part of the County. Coinciding with this shift is an emphasis on suburbanization.

Population Distribution

As depicted on Figure 2-1, the "developed" eastern portion of the County is much more densely populated than the "developing" western portion. Table 2-2 provides the accompanying numerical data. The eastern municipalities encompass 89.95 square miles, which is 49% of the total land mass, whereas the western municipalities encompass 94.48 square miles, accounting for 51%. However, 78.4% of the County's population is in the eastern half.

County density patterns mirror the County's population distribution. For instance, municipal densities are generally much lower in the developing western/northern portions of the County than in the developed eastern/southern portions of the County. Western municipalities are typically larger and contain smaller populations. Chadds Ford Township, the least dense municipality in the County, has a density of 359 persons/square mile. Chadds Ford Township has the ninth largest land area (8.84 square miles) with a 2000 population of 3,170.

The majority of the County's population is concentrated in the eastern part of the County. Despite the fact that the eastern portion of the County contains several large municipalities, most of this area is characterized by small, heavily populated boroughs that border West Philadelphia. Millbourne Borough, the densest municipality in the County, has a density of 13,471 persons per square mile. Millbourne Borough has the smallest land area (0.07 square mile) with a population of 943.

FUTURE POPULATION

The current population shift experienced by Delaware County is expected to continue. Table 2-3 presents the population forecasts for the next twenty-five years as formulated by DVRPC based on Census 2000 population counts.

With the exception of a very few municipalities, the population for most of the eastern municipalities is forecasted to decrease or to stay relatively stable through 2025. In contrast, most of the western municipalities are expected to increase. This can be clearly seen in Figure 2-2 where the darker colored areas, representing the greatest population growth, are found in the western half of the County. For example, the population of western municipalities such as Chester Heights Borough and Bethel, Chadds Ford, Concord, and Edgmont Townships is expected to increase substantially, with a range of 48.6% to 62.8%. In the meantime, eastern municipalities such as

Insert Figure 2-1

TABLE 2-2

DELAWARE COUNTY POPULATION DENSITY, 2000

Eastern Municipalities			
Municipality	**2000 Population**	**Square Miles**	**Persons Per Square Mile**
Aldan Borough	4,313	0.59	7,310
Chester City	36,854	4.77	7,726
Chester Township	4,604	1.38	3,336
Clifton Heights Borough	6,779	0.62	10,934
Collingdale Borough	8,664	0.87	9,959
Colwyn Borough	2,453	0.25	9,812
Darby Borough	10,299	0.81	12,715
Darby Township	9,622	1.64	5,867
East Lansdowne Borough	2,586	0.21	12,314
Eddystone Borough	2,442	0.96	2,544
Folcroft Borough	6,978	1.38	5,057
Glenolden Borough	7,476	0.86	8,693
Haverford Township	48,498	9.95	4,874
Lansdowne Borough	11,044	1.20	9,203
Lower Chichester Township	3,591	1.06	3,388
Marcus Hook Borough	2,314	1.14	2,030
Marple Township	23,737	10.43	2,276
Millbourne Borough	943	0.07	13,471
Morton Borough	2,715	0.36	7,542
Nether Providence Township	13,456	4.64	2,900
Norwood Borough	5,985	0.81	7,389
Parkside Borough	2,267	0.19	11,932
Prospect Park Borough	6,594	0.73	9,033
Radnor Township	30,878	13.83	2,233
Ridley Township	30,791	5.18	5,944
Ridley Park Borough	7,196	1.04	6,919
Rutledge Borough	860	0.15	5,733
Sharon Hill Borough	5,468	0.77	7,101
Springfield Township	23,677	6.29	3,764
Swarthmore Borough	6,170	1.38	4,471
Tinicum Township	4,353	5.53	787
Trainer Borough	1,901	0.98	1,940
Upland Borough	2,977	0.66	4,511
Upper Darby Township	81,821	7.62	10,738
Yeadon Borough	11,762	1.60	7,351
Eastern Municipalities	**432,068**	**89.95**	**4,803**

TABLE 2-2

DELAWARE COUNTY POPULATION DENSITY, 2000 (CONTINUED)

Western Municipalities			
Municipality	**2000 Population**	**Square Miles**	**Persons Per Square Mile**
Aston Township	16,203	5.90	2,746
Bethel Township	6,421	5.44	1,180
Brookhaven Borough	7,985	1.69	4,725
Chadds Ford Township	3,170	8.84	359
Chester Heights Borough	2,481	2.17	1,143
Concord Township	9,933	13.78	721
Edgmont Township	3,918	9.74	402
Media Borough	5,533	0.75	7,377
Middletown Township	16,064	13.43	1,196
Newtown Township	11,700	10.11	1,157
Rose Valley Borough	944	0.74	1,276
Thornbury Township	7,093	9.16	774
Upper Chichester Township	16,842	6.80	2,477
Upper Providence Township	10,509	5.93	1,772
Western Municipalities	**118,796**	**94.48**	**1,257**
Delaware County	**550,864**	**184.43**	**2,987**

Source: U.S. Department of Commerce, Bureau of the Census; prepared by DCPD, 2001

Collingdale, Colwyn, Darby, East Lansdowne, and Sharon Hill Boroughs as well as Darby Township are all expected to decrease in population by a margin of more than 11%.

Table 2-4 presents the projected density figures for both the eastern and western municipalities. In the suburban West, the municipalities are generally projected to experience population (and associated density) increases, which may influence the need for sewage treatment alternatives other than individual on-site systems. The reverse is true in the urbanized East where, with the exception of three municipalities, municipal populations and associated densities are expected to decrease, in some cases significantly.

The increase in population will also bring an increase in employment, and increased employment will result in increased sewage disposal needs. Table 2-5 presents the employment forecasts for Delaware County. Like the population forecasts, employment is anticipated to grow at a much greater rate in the western municipalities than in the eastern municipalities.

TABLE 2-3

DELAWARE COUNTY POPULATION FORECASTS

Eastern Municipalities								
	Census		2005- 2025 DVRPC Forecasts					
Municipality	1990	2000	2005	2010	2015	2020	2025	% Change 00-25
Aldan Borough	4,549	4,313	4,180	4,160	4,030	3,980	3,970	-8.0%
Chester City	41,856	36,854	34,840	35,190	34,880	35,020	35,354	-4.1%
Chester Township	5,399	4,604	4,510	4,460	4,340	4,272	4,170	-9.4%
Clifton Heights Borough	7,111	6,779	6,590	6,480	6,280	6,150	5,990	-11.6%
Collingdale Borough	9,175	8,664	8,390	8,220	7,940	7,750	7,500	-13.4%
Colwyn Borough	2,613	2,453	2,360	2,300	2,220	2,150	2,060	-16.0%
Darby Borough	11,140	10,299	9,960	9,750	9,390	9,170	8,860	-14.0%
Darby Township	10,955	9,622	9,310	9,080	8,720	8,440	8,090	-15.9%
East Lansdowne Borough	2,691	2,586	2,510	2,440	2,350	2,290	2,220	-14.2%
Eddystone Borough	2,446	2,442	2,380	2,340	2,280	2,230	2,170	-11.1%
Folcroft Borough	7,506	6,978	6,770	6,630	6,390	6,210	5,980	-14.3%
Glenolden Borough	7,260	7,476	7,290	7,180	6,970	6,830	6,620	-11.4%
Haverford Township	49,848	48,498	47,500	47,010	46,910	46,840	46,770	-3.6%
Lansdowne Borough	11,712	11,044	10,700	10,490	10,140	9,920	9,610	-13.0%
Lower Chichester Township	3,660	3,591	3,500	3,450	3,350	3,300	3,210	-10.6%
Marcus Hook Borough	2,546	2,314	2,250	2,200	2,120	2,080	2,020	-12.7%
Marple Township	23,123	23,737	23,890	23,830	23,720	23,710	23,330	-1.7%
Millbourne Borough	831	943	930	940	940	940	960	1.8%
Morton Borough	2,851	2,715	2,780	2,800	2,780	2,810	2,830	4.2%
Nether Providence Township	13,229	13,456	13,770	13,760	14,020	13,990	13,940	3.6%
Norwood Borough	6,162	5,985	6,100	6,030	5,870	5,770	5,620	-6.1%

TABLE 2-3

DELAWARE COUNTY POPULATION FORECASTS

(CONTINUED)

Eastern Municipalities								
	Census		2005- 2025 DVRPC Forecasts					
Municipality	1990	2000	2005	2010	2015	2020	2025	% Change 00-25
Parkside Borough	2,369	2,267	2,220	2,200	2,140	2,110	2,070	-8.7%
Prospect Park Borough	6,764	6,594	6,450	6,400	6,260	6,210	6,110	-7.3%
Radnor Township	28,703	30,878	30,870	31,210	31,170	31,460	31,480	1.9%
Ridley Park Borough	7,592	7,196	7,270	7,160	6,940	6,800	6,610	-8.1%
Ridley Township	31,169	30,791	30,670	30,450	29,390	28,620	27,610	-10.3%
Rutledge Borough	843	860	870	850	810	790	760	-11.6%
Sharon Hill Borough	5,771	5,468	5,280	5,150	4,950	4,800	4,710	-13.9%
Springfield Township	24,160	23,677	23,600	22,590	22,590	22,180	22,340	-5.6%
Swarthmore Borough	6,157	6,170	6,170	6,230	6,090	6,040	5,930	-3.9%
Tinicum Township	4,440	4,353	4,410	4,360	4,250	4,190	4,100	-5.8%
Trainer Borough	2,271	1,901	1,870	1,870	1,840	1,840	1,820	-4.3%
Upland Borough	3,334	2,977	2,880	2,830	2,720	2,650	2,650	-11.0%
Upper Darby Township	81,177	81,821	83,210	80,650	77,580	75,510	74,950	-8.4%
Yeadon Borough	11,980	11,762	11,440	11,290	10,970	10,800	10,540	-10.4%
Eastern Municipalities	**443,393**	**432,068**	**427,720**	**421,980**	**413,340**	**407,852**	**402,954**	**-6.7**

TABLE 2-3

DELAWARE COUNTY POPULATION FORECASTS

(CONTINUED)

Western Municipalities								
	Census		2005- 2025 DVRPC Forecasts					
Municipality	1990	2000	2005	2010	2015	2020	2025	% Change 00-25
Aston Township	15,080	16,203	17,180	17,630	18,150	18,720	19,260	18.9%
Bethel Township	3,330	6,421	7,110	7,640	8,090	8,910	9,540	48.6%
Brookhaven Borough	8,567	7,985	7,910	7,920	7,900	7,960	7,960	-0.3%
Chadds Ford Township	3,118	3,170	3,360	3,660	3,920	4,340	4,760	50.2%
Chester Heights Borough	2,273	2,481	2,680	2,890	3,110	3,490	3,990	60.8%
Concord Township	6,933	11,239	12,130	13,230	14,140	15,580	16,920	50.5%
Edgmont Township	2,735	3,918	4,240	4,790	5,340	6,030	6,380	62.8%
Media Borough	5,957	5,533	5,400	5,330	5,180	5,100	5,060	-8.5%
Middletown Township	14,130	16,064	16,070	16,370	16,410	16,850	17,690	10.1%
Newtown Township	11,366	11,700	11,570	12,000	12,240	12,170	12,140	3.8%
Rose Valley Borough	982	944	940	940	930	930	1,010	7.0%
Thornbury Township	5,056	5,787	6,780	7,140	7,380	7,840	8,300	43.4%
Upper Chichester Township	15,004	16,842	17,510	18,400	19,020	19,700	20,350	20.8%
Upper Providence Township	9,727	10,509	10,930	11,050	11,420	11,500	11,470	9.1%
Western Municipalities	**104,258**	**118,796**	**123,810**	**128,990**	**133,230**	**139,120**	**144,830**	**21.9%**
Delaware County	**547,651**	**550,864**	**551,530**	**550,970**	**546,570**	**546,972**	**547,784**	**-0.6%**

Source: U.S. Department of Commerce, Bureau of the Census; prepared by DCPD, 2002

The projected shift in population and employment will also shift sewage disposal needs. Where western Delaware County will need increased disposal capacity, eastern Delaware County may have excess treatment capacity available. Subsequent sections of this plan will consider this "balancing" of disposal needs and treatment capacity as an option for western Delaware County.

Insert Figure 2-2

TABLE 2-4

DELAWARE COUNTY DENSITY FORECASTS

Eastern Municipalities						
Municipality	**Square Miles**	**2000 Population**	**2000 Persons Per Square Mile**	**2025 Population**	**2025 Persons Per Square Mile**	**Change in Persons Per Square Mile 2000 to 2025**
Aldan Borough	0.59	4,313	7,310	3,970	6,729	-581
Chester City	4.77	36,854	7,726	35,354	7,412	-59
Chester Township	1.38	4,604	3,336	4,170	3,022	-314
Clifton Heights Borough	0.62	6,779	10,934	5,990	9,661	-999
Collingdale Borough	0.87	8,664	9,959	7,500	8,621	-1338
Colwyn Borough	0.25	2,453	9,812	2,060	8,240	-1572
Darby Borough	0.81	10,299	12,715	8,860	10,938	-1234
Darby Township	1.64	9,622	5,867	8,090	4,933	-934
East Lansdowne Borough	0.21	2,586	12,314	2,220	10,571	-1743
Eddystone Borough	0.96	2,442	2,544	2,170	2,260	-283
Folcroft Borough	1.38	6,978	5,057	5,980	4,333	-723
Glenolden Borough	0.86	7,476	8,693	6,620	7,698	-995
Haverford Township	9.95	48,498	4,874	46,770	4,701	-174
Lansdowne Borough	1.20	11,044	9,203	9,610	8,008	-961
Lower Chichester Township	1.06	3,591	3,388	3,210	3,028	-360
Marcus Hook Borough	1.14	2,314	2,030	2,020	1,772	-258
Marple Township	10.43	23,737	2,276	23,330	2,237	-39
Millbourne Borough	0.07	943	13,471	960	13,714	243
Morton Borough	0.36	2,715	7,542	2,830	7,861	652
Nether Providence Township	4.64	13,456	2,900	13,940	3,004	104
Norwood Borough	0.81	5,985	7,389	5,620	6,938	-451
Parkside Borough	0.19	2,267	11,932	2,070	10,895	-1037

TABLE 2-4

DELAWARE COUNTY DENSITY FORECASTS

(CONTINUED)

Eastern Municipalities						
Municipality	**Square Miles**	**2000 Population**	**2000 Persons Per Square Mile**	**2025 Population**	**2025 Persons Per Square Mile**	**Change in Persons Per Square Mile 2000 to 2025**
Prospect Park Borough	0.73	6,594	9,033	6,110	8,370	-663
Radnor Township	13.83	30,878	2,233	31,480	2,276	-18
Ridley Park Borough	1.04	7,196	6,919	6,610	6,356	-563
Ridley Township	5.18	30,791	5,944	27,610	5,330	-629
Rutledge Borough	0.15	860	5,733	760	5,067	-667
Sharon Hill Borough	0.77	5,468	7,101	4,710	6,117	-828
Springfield Township	6.29	23,677	3,764	22,340	3,552	-213
Swarthmore Borough	1.38	6,170	4,471	5,930	4,297	-174
Tinicum Township	5.53	4,353	787	4,100	741	-38
Trainer Borough	0.98	1,901	1,940	1,820	1,857	-83
Upland Borough	0.66	2,977	4,511	2,650	4,015	-495
Upper Darby Township	7.62	81,821	10,738	74,950	9,836	-1644
Yeadon Borough	1.6	11,762	7,351	10,540	6,588	-807
Eastern Municipalities	**89.95**	**432,068**	**4,803**	**402,954**	**4,480**	**-325**

TABLE 2-4

DELAWARE COUNTY DENSITY FORECASTS
(CONTINUED)

Western Municipalities						
Municipality	**Square Miles**	**2000 Population**	**2000 Persons Per Square Mile**	**2025 Population**	**2025 Persons Per Square Mile**	**Change in Persons Per Square Mile 2000 to 2025**
Aston Township	5.90	16,203	2,746	19,260	3,264	717
Bethel Township	5.44	6,421	1,180	9,540	1,754	573
Brookhaven Borough	1.69	7,985	4,725	7,960	4,710	-15
Chadds Ford Township	8.84	3,170	359	4,760	538	229
Chester Heights Borough	2.17	2,481	1,143	3,990	1,839	695
Concord Township	13.78	11,239	816	16,920	1,228	412
Edgmont Township	9.74	3,918	402	6,380	655	253
Media Borough	0.75	5,533	7,377	5,060	6,747	-631
Middletown Township	13.43	16,064	1,196	17,690	1,317	121
Newtown Township	10.11	11,700	1,157	12,140	1,201	44
Rose Valley Borough	0.74	944	1,276	1,010	1,365	89
Thornbury Township	9.16	5,787	632	8,300	906	274
Upper Chichester Township	6.80	16,842	2,477	20,350	2,993	583
Upper Providence Township	5.93	10,509	1,772	11,470	1,934	162
Western Municipalities	**94.48**	**118,796**	**1,257**	**144,830**	**1,533**	**276**
Delaware County	**184.43**	**550,864**	**2,987**	**547,784**	**2,970**	**-57**

Source: U.S. Department of Commerce, Bureau of the Census; prepared by DCPD, 2002

TABLE 2-5

DELAWARE COUNTY EMPLOYMENT FORECASTS

Eastern Municipalities								
	Census	2000 - 2025 DVRPC Employment Forecasts						
Municipality	1990	2000	2005	2010	2015	2020	2025	% Change 00-25
Aldan Borough	599	760	840	850	940	970	970	27.60%
Chester City	14,765	12,110	11,110	10,680	9,790	9,730	7,660	-36.70%
Chester Township	1,101	2,140	2,630	2,900	3,190	3,360	3,420	59.80%
Clifton Heights Borough	3,321	3,190	3,100	2,990	2,880	2,790	2,630	-17.60%
Collingdale Borough	1,966	1,870	1,830	1,790	1,760	1,710	1,620	-13.40%
Colwyn Borough	331	320	310	300	300	290	270	-15.60%
Darby Borough	3,441	3,020	2,900	2,900	2,900	2,900	2,900	-4.00%
Darby Township	833	810	800	770	720	680	600	-25.90%
East Lansdowne Borough	498	490	470	460	450	450	430	-12.20%
Eddystone Borough	3,464	2,790	2,630	2,540	2,480	2,470	2,410	-13.60%
Folcroft Borough	4,041	3,150	2,940	2,880	2,740	2,690	2,710	-14.00%
Glenolden Borough	2,505	2,260	2,210	2,140	2,090	2,000	1,880	-16.80%
Haverford Township	14,428	13,980	13,870	13,700	13,630	13,380	12,880	-7.90%
Lansdowne Borough	2,989	2,890	2,820	2,740	2,680	2,590	2,450	-15.20%
Lower Chichester Township	799	940	1,000	1,050	1,110	1,130	1,140	21.30%
Marcus Hook Borough	3,492	3,040	2,840	2,730	2,550	2,430	2,200	-27.60%
Marple Township	9,866	11,840	12,700	13,460	14,340	14,960	15,300	29.20%
Millbourne Borough	381	330	340	330	330	310	310	-6.10%
Morton Borough	1,348	1,260	1,240	1,220	1,200	1,180	1,140	-9.50%
Nether Providence Township	4,015	4,090	4,360	4,830	5,390	6,210	6,810	66.50%
Norwood Borough	783	770	750	740	730	730	720	-6.50%
Parkside Borough	184	190	190	200	220	250	280	47.40%

TABLE 2-5

DELAWARE COUNTY EMPLOYMENT FORECASTS
(CONTINUED)

Eastern Municipalities								
	Census	2000 - 2025 DVRPC Employment Forecasts						
Municipality	1990	2000	2005	2010	2015	2020	2025	% Change 00-25
Prospect Park Borough	1,621	1,590	1,570	1,550	1,540	1,520	1,470	-7.50%
Radnor Township	28,446	29,450	30,430	31,800	33,420	35,200	36,350	23.40%
Ridley Park Borough	2,576	2,370	2,280	2,120	1,920	1,870	1,780	-24.90%
Ridley Township	11,839	13,860	14,370	15,970	17,860	18,780	19,210	38.60%
Rutledge Borough	96	100	110	130	140	180	210	110.00%
Sharon Hill Borough	2,137	2,690	2,970	3,260	3,600	3,910	4,160	54.60%
Springfield Township	11,419	11,300	11,230	11,230	11,150	11,020	10,670	-5.60%
Swarthmore Borough	3,222	3,250	3,300	3,100	3,090	3,090	3,080	-5.20%
Tinicum Township	6,013	6,100	6,610	6,250	5,930	5,840	5,840	-4.30%
Trainer Borough	821	1,170	1,270	1,310	1,350	1,310	1,250	6.80%
Upland Borough	4,036	4,170	4,340	4,530	4,760	4,950	5,060	21.30%
Upper Darby Township	21,275	20,090	19,470	18,640	17,940	16,900	16,600	-17.40%
Yeadon Borough	3,385	3,370	3,350	3,310	3,280	3,190	3,050	-9.50%
Eastern Municipalities	**172,036**	**171,750**	**173,180**	**175,400**	**178,400**	**180,970**	**179,460**	**4.49%**

TABLE 2-5

DELAWARE COUNTY EMPLOYMENT FORECASTS
(CONTINUED)

Western Municipalities								
	Census	2000 - 2025 DVRPC Employment Forecasts						
Municipality	1990	2000	2005	2010	2015	2020	2025	% Change 00-25
Aston Township	5,864	6,430	6,880	7,450	8,110	8,850	9,470	47.3%
Bethel Township	909	1,060	1,190	1,330	1,490	1,610	1,850	74.5%
Brookhaven Borough	2,237	2,370	2,480	2,600	2,740	2,870	2,950	24.5%
Chadds Ford Township	5,487	7,160	8,470	9,900	11,300	12,210	12,980	81.3%
Chester Heights Borough	1,738	2,100	2,340	2,600	2,890	3,100	3,240	54.3%
Concord Township	3,974	4,930	5,490	6,090	6,780	7,450	8,020	62.7%
Edgmont Township	1,203	1,520	1,700	1,920	2,180	2,500	2,810	84.9%
Media Borough	11,210	11,360	11,650	11,790	12,000	12,030	12,010	5.7%
Middletown Township	10,726	10,710	10,900	11,480	11,710	12,230	12,070	12.7%
Newtown Township	7,195	8,090	8,640	9,230	9,910	10,540	10,990	35.8%
Rose Valley Borough	121	130	130	130	130	130	130	0.0%
Thornbury Township	2,221	2,500	2,740	3,020	3,350	3,700	4,020	60.8%
Upper Chichester Township	2,657	3,140	3,370	3,570	3,810	3,970	4,060	29.3%
Upper Providence Township	2,881	3,080	3,230	3,390	3,570	3,740	3,830	24.4%
Western Municipalities	**58,423**	**64,580**	**69,210**	**74,500**	**79,970**	**84,930**	**88,430**	**36.9%**
Delaware County	**230,459**	**236,330**	**242,390**	**249,900**	**258,370**	**265,900**	**269,890**	**14.2%**

Source: U.S. Department of Commerce, Bureau of the Census; DVRPC, 2002

CHAPTER 3

EXISTING WASTEWATER TREATMENT AND CONVEYANCE SYSTEMS

WASTEWATER TREATMENT AND CONVEYANCE ORGANIZATIONS SERVING DELAWARE COUNTY

Most of Delaware County's domestic sewage is currently conveyed and/or treated by one or more of the twenty public governmental authorities charged with these tasks (refer to Table 1-3 in Chapter 1). Homes and businesses in portions of the County not served by these authorities utilize individual on-site or community treatment systems constructed to serve their respective homes or businesses. The following is a discussion of those municipal and nonmunicipal wastewater treatment (T) and conveyance systems (C) operating in the western planning area. Note that some of these authorities serve more than one function within any given municipality.

Public organizations currently providing sewage treatment or conveyance service within the western planning area are:

- Brookhaven Borough (T, C)
- Chadds Ford Township Sewer Authority (T, C)
- Concord Township Sewer Authority (T, C)
- Delaware County Regional Water Quality Control Authority (DELCORA) (T, C)
- Rose Valley Borough (T, C)
- Southwest Delaware County Municipal Authority (SWDCMA) (T, C)
- Thornbury Township Board of Supervisors (T, C)
- City of Wilmington, DE (T, C)
- Bethel Township Sewer Authority (C)
- Middletown Township Sewer Authority (C)
- Newtown Township Municipal Sewer Authority (C)
- Southern Delaware County Authority (C)
- Upper Providence Sewer Authority (C)
- New Castle County (C)

Currently, there are thirty-three private community treatment systems in western Delaware County. These systems are often operated and maintained by private contractors including:

- Aqua Pennsylvania, Inc. (Media) (T, C)
- American Water Services (14 facilities) (T, C)
- TMH Environmental (2 facilities) (T, C)

A great deal of information associated with the many sewer systems noted has been documented in digital form. For more information regarding geographic information system (GIS) mapping that accompanies this report, refer to Appendix A, which

discusses the mapping process. Figure 3-1 shows the service area of the public and private organizations and the location of their treatment facilities. The plate in the back pocket of the report is a composite of the discussion in this chapter.

PUBLIC ORGANIZATIONS PROVIDING SEWAGE TREATMENT AND CONVEYANCE WITHIN THE WESTERN STUDY AREA

Wastewater Treatment Organizations

Brookhaven Borough

Organizational Description

Sewage treatment in the Borough of Brookhaven is provided as a function of the local municipal government. The plant is financially self-sufficient; capital funds are raised through bond issues while operations and maintenance expenses and debt service are covered by user charges. Besides the treatment plant, Brookhaven owns and operates a sewer collection system that is tributary to both its treatment facility and to SWDCMA's Baldwin Run Pollution Control Facility in Aston as shown in Figure 3-2.

Treatment Facility Description

The Brookhaven Wastewater Treatment Plant (WWTP) is located at 2 Cambridge Road in Brookhaven. The plant was built in 1935 to serve an equivalent population of 3,000. The plant's current average design flow is 0.192 MGD, with design organic capacity of 320 lbs. of 5-day biochemical oxygen demand (BOD_5) per day. Secondary treatment is achieved through a two-stage, high-rate trickling filter process, with recirculation in each stage. Effluent is chlorinated and discharged to Chester Creek under NPDES Permit No. PA0023949 (National Pollutant Discharge Elimination System).

Previous Upgrades

In 2001, the Borough added a 400,000-gallon tank to hold flows so that during extensive wet weather periods the plant will still be able to process sewage flow efficiently. In addition, another final treatment tank was added to increase the treatment time before discharging. The Borough also eliminated the existing primary treatment tank and replaced it with a state-of-the-art primary treatment tank.

Other Issues

The treatment plant has historically experienced flows in excess of twice the plant's permitted capacity during wet weather events. This is indicative of an inflow problem in the sewage collection system. The Borough has discussed this topic in its newsletter to residents and stressed the importance of disconnecting sump pumps and roof drains.

Insert Figure 3-1

Insert Figure 3-2

Scheduled Upgrades

No upgrades are currently scheduled.

Current Plant Status

In 2000, an annual average flow of 0.169 MGD was discharged, with a 3-month maximum average daily flow of 0.201 MGD. Annual average BOD_5 load is 236 lbs. per day.

Conveyance Facilities Description

Conveyance Lines

The Borough owns and maintains sanitary sewer lines as shown on Figure 3-2.

Pump Stations

The Borough has no pump stations.

Sludge/Biosolids Generation

No information was provided by the Borough on solids collection during the treatment process or ultimate disposal of these solids.

Chadds Ford Township Sewer Authority

Organizational Description

The Chadds Ford Township Board of Supervisors, pursuant to the Municipality Authorities Act, established the Chadds Ford Township Sewer Authority (CFTSA) in 1988. CFTSA was authorized to exercise all powers granted under the Act to implement the wastewater management plan for its service area. CFTSA's role as an implementation agency involves the acquisition, holding, construction, improvement, maintenance, operation, owning, and leasing of the sewer system and sewer treatment facilities. CFTSA is financially self-sufficient; capital funds are raised through bond issues, while operations and maintenance expenses and debt service are covered by user charges. CFTSA owns and maintains the 0.08 MGD Ridings WWTP located at Ridge Road and Ridings Boulevard, as well as a system of wastewater conveyance facilities and collector sewers as shown in Figure 3-3.

There are currently six private treatment facilities permitted within Chadds Ford Township that serve more than a single residence. Information on these facilities is provided in a subsequent section. In addition to the NPDES permitted facilities, there are a significant number of on-lot treatment systems in the Township, which are discussed in Chapter 4.

Treatment Facility Description

CFTSA owns and operates the Ridings WWTP. This facility was constructed in 1994 and had a permitted capacity of 0.04 MGD. After a 1996 expansion, this limit was raised to 0.08 MGD. The plant serves the Ridings and Ridings II residential communities and accepts additional flow from the Township. The plant operates under NPDES Permit No. PA0055476 and has a design organic load limit of 167 lbs. of BOD_5 per day. The treatment process involves a sequencing batch reactor and dual basins. The plant discharges to an unnamed tributary of Harvey Run.

Previous Upgrades

A major expansion took place in 1996 which increased the plant's capacity to its current level.

Other Issues

The plant is operating well under capacity and has no process problems.

Scheduled Upgrades

No upgrades are currently scheduled at the facility. CFTSA is planning to approach DEP in the near future with a request to re-rate the plant to a 0.09 or 0.1 MGD capacity (final figure to be determined shortly by additional tests).

Current Plant Status

In 2000, the facility had an average monthly flow of 0.022 MGD and a maximum 3-month average flow of 0.026 MGD.

Conveyance Facilities Description

Conveyance Lines

The Authority owns and maintains about 16,600 linear feet (LF) of gravity sewer lines. This includes 2,400 LF of sewer currently under construction. CFTSA owns 3,000 LF (est. 6" diameter) of force main from the Smithbridge Pump Station to the Plant Influent Pump Station. Grinder pumps and lateral connections are privately owned and maintained.

Pump Stations

There are four pump stations (PS) that are owned and operated by CFTSA: Lower (Smithbridge) PS, Plant Influent PS serving the Ridings WWTP, Intermediate (Eckman) PS serving the Knights Bridge WWTP, and a new Urban PS located off of Woodland

Insert Figure 3-3

Drive. Urban PS was constructed to serve the sewer extension to Woodland Summit and Brandywine Summit office buildings.

Sludge/Biosolids Generation

Sludge from the Ridings WWTP is hauled by Concord Wastewater Services to the SWDCMA Baldwin Run facility in Aston.

Concord Township Sewer Authority

Organizational Description

The Concord Township Board of Supervisors, pursuant to the Municipality Authorities Act, established the Concord Township Sewer Authority (CTSA) on September 14, 1973. CTSA was authorized to exercise all powers granted under the Act to implement the wastewater management plan for its service area. CTSA's role as an implementation agency involves the acquisition, holding, construction, improvement, maintenance, operation, ownership, and leasing of the sewer system and sewer treatment facilities. CTSA is financially self-sufficient; capital funds are raised through tap-in fees while operations and maintenance expenses are covered by user charges. CTSA does not have any debt service as of December 31, 2001. CTSA owns and maintains the 1.2 MGD Central Sewage Treatment Plant located at 664 Concord Road, as well as a system of wastewater conveyance facilities and collector sewers as shown in Figure 3-4.

Treatment Facility Description

The CTSA WWTP was constructed in 1996 and discharges to Chester Creek. The plant is an extended aeration type system that was originally designed for 1.2 MGD but was permitted for 0.6 MGD. In 1997, the discharge limit was increased to 1.2 MGD. Design organic load is 2,500 lbs. of BOD_5 per day. The plant operates under NPDES Permit No. PA0055212. About 40% of the current flow comes from Delaware County Prison, 56% from residential sources, and 4% from commercial sources. Currently there are no industrial contributors.

Previous Upgrades

No upgrades have been performed at this facility.

Other Issues

Major development is expected in the plant service area. Construction of an on-site process plant is underway at the new Toll Brothers development (Riviera at Concord) which will be dedicated to CTSA. The plant's ultimate expansion design is 0.21 MGD, with current design at 0.07 MGD.

Scheduled Upgrades

The following upgrades are scheduled at the CTSA WWTP: fine bubble air aeration, expansion of plant pre-treatment, and ultraviolet disinfection.

Current Plant Status

The plant is currently operating at less than its permitted discharge and is achieving permit limitations. Average daily flow in the year 2001 was 0.390 MGD, while the 3-month maximum average daily flow was 0.406 MGD.

Conveyance Facilities Description

Conveyance Lines

CTSA owns and maintains a 12-mile collection system that serves the plant. This system is relatively new and currently has no significant problems. All lines and manholes are inspected manually or by video and are flushed prior to dedication. Repairs are required prior to dedication.

Pump Stations

CTSA owns and maintains the following pump stations:

- Concord Hunt PS
- Concord Woods PS
- Chase #1 & #2 PS (not dedicated)
- Cheyney Road PS
- Honold (Twin Creeks at Mendenhall) PS
- Brinton Lake PS (not dedicated)
- Fox Valley Life Campus PS (not dedicated)
- Beaver Valley Road PS (not dedicated)
- Windmill Creek II PS (not dedicated)

No problems have been reported with any of these facilities.

Sludge/Biosolids Generation

Solids are accumulated in Tank 1 of the facility. CTSA is in year three of its contract with EarthCare, which collects liquid sludge every four to six weeks and hauls it to the DELCORA facility in Chester.

Insert Figure 3-4

Delaware County Regional Water Quality Control Authority

Organizational Description

DELCORA was established in 1971 by the Delaware County Commissioners pursuant to the Municipality Authorities Act, and its Board of Directors is appointed by Delaware County Council. DELCORA was authorized to exercise all powers granted under the Act to implement the Countywide wastewater management plan. DELCORA's role as an implementation agency involves the acquisition, holding, construction, improvement, maintenance, operation, owning, and leasing of sewer systems and sewage treatment facilities. DELCORA is financially self-sufficient; capital funds are raised through bond issues, while operations and maintenance expenses and debt service are covered by user charges. DELCORA owns and maintains the 44 MGD WRTP located in Chester, as well as an extensive system of wastewater conveyance facilities, and, in certain municipalities, the collector sewers.

DELCORA's service area is divided into eastern and western regional drainage districts as established in the 1974 Albreit and Friel plan. The eastern regional drainage district serves a significant portion of the County's population east of Crum Creek (26 municipalities). The western regional drainage district includes the City of Chester as well as all or part of Brookhaven, Marcus Hook, Parkside, Trainer, and Upland Boroughs and Chester Township. In 2002, SDCA completed a force main that directs most of its flows to the WRTP.

Treatment Facility Description

The DELCORA WRTP is located at the foot of Booth Street in the City of Chester and serves DELCORA's western service area. The plant, which has a rated treatment capacity of 44 MGD (92.3 MGD maximum with 30 MGD recycled to aeration basins), discharges to the Delaware River under NPDES Permit No. PA0027103. In 2000, DELCORA averaged 31.2 MGD of flow through the WRTP with a maximum flow of 63.9 MGD. As noted in the Chapter 94 Report, organic capacity is not applicable since the NPDES permit for the plant addresses effluent. The design organic loading for the plant influent is 91,740 lbs. of BOD_5 per day. During 2000, the WRTP averaged 30,285 lbs. of BOD_5 per day in the influent and discharged 968 lbs. per day.

The plant employs an aerated waste activated sludge process that provides primary and secondary treatment levels. The treatment processes include primary clarification, aeration, secondary clarification, post-aeration, and disinfection by chlorination. Sludge is thickened, dewatered, and incinerated. The ash is stored and transported to the City of Wilmington, DE, sludge stabilization facility for disposal. During 2000, DELCORA landfilled 8,041 dry metric tons of ash. Wastewater flow to the WRTP is first treated in a preaeration basin. Next, solids are settled and removed during primary clarification. Flow is then directed to the aeration tanks where biological action takes place to remove organics. From the aeration tanks, flow is transferred to final clarifiers where more solids are settled

and removed. The final step is the chlorine contact tanks, where disinfection to eliminate pathogens and bacteria takes place prior to discharge to the Delaware River.

Approximately 60% of DELCORA's WRTP flow is categorized as industrial wastewater (industrial reserve capacity of 29 MGD). Note that 99% of the industrial flows are generated by two major industries, Kimberly-Clark Tissue Co. and Sun Company-Marcus Hook Refinery. The list of the significant industrial users that discharge to the WRTP is shown in Table 3-1.

All industrial waste discharging to the WRTP must have a DELCORA-issued Industrial Waste Permit in accordance with the EPA-approved treatment program. Pretreated industrial wastewater must comply with limits established by DELCORA and approved by EPA.

TABLE 3-1

SIGNIFICANT INDUSTRIAL USERS DISCHARGING TO THE WRTP

Significant Industrial User	Permitted Discharge (gpd)
Kimberly-Clark Tissue Co.	16,500,000
Sun Company-Marcus Hook Refinery	12,000,000
P.Q. Corporation	125,000
Foamex International, Inc.	80,000
Medford Incorporated	80,000
Stoney Creek Technologies, LLC	80,000
Esschem, Inc.	15,000
Marvec Manufacturing, Inc.	7,500
Kozmer Technologies, Ltd.	1,000

Source: DCPD, 2002

Previous Upgrades

Over the past several years, DELCORA has been in the process of implementing contract improvements to upgrade the treatment at the WRTP. During 1989, DELCORA began a program to adjust the equipment and treatment process to improve effluent quality. Upgrades that have been completed at the WRTP include:

- Modifications in the delivery and storage of chlorine.
- Overhaul of the secondary clarifiers.
- Modifications to the raw sewage pump station.
- Construction of a fifth clarifier.

Other Issues

On June 12, 1991, the City of Philadelphia transmitted a letter to DELCORA notifying the County of the City's intent to terminate its Agreement to treat wastewater from Delaware County upon its 30-year term on March 15, 2004. In general, the reasons for this relate to disagreements over capital contribution payments and increased wastewater treatment rates. In 1995, the dispute was settled, and DELCORA and the City executed an amendment to the Agreement that served as a settlement of the dispute.

In a legal opinion prepared by DELCORA's solicitor, Blank Rome Comisky & McCauley LLP, it was determined that, "The City's 1991 letter did not constitute notice of termination of the Agreement..." because the timing of the 1991 letter was not consistent with the termination clause in the March 15, 1974 Agreement. Also, given the fact that the City's issues were addressed in the 1995 Agreement, and the City has not since served a termination notice in accordance with the requirements of the 1974 Agreement, the Agreement with the City has not yet been terminated.

Scheduled Upgrades

During 1989, DELCORA began a program to adjust the equipment and treatment process to improve effluent quality. It is DELCORA's intention to maximize the utilization of the WRTP. Plans to increase the rated capacity of the WRTP are being considered at this time. Upgrades currently underway or in progress at the WRTP include:

- Rehabilitation of the grit removal system (to be completed in 2004).
- Modifications to the sludge delivery and mixing system (construction to start in 2003).
- Replacement of the mechanical surface aerators with submerged fine bubble diffusers (construction to start in 2003).
- Modifications to the belt presses.
- Automation of process system control and data acquisition.

Current Plant Status

According to DELCORA's 2000 Chapter 94 Report, the "...WRTP continued to discharge high quality effluent ..." except for the January and February time period where BOD percent removal and total BOD discharge exceeded permit limits. These events "...were a direct result of a series of three toxic shock loads that entered the DELCORA aeration system between January 24 and February 12, 2000. DELCORA took swift remedial actions to correct the problems that existed with the operating system and the affected parameters. By March, all parameters were in compliance." According to DELCORA's 2001 and 2002 Chapter 94 Reports, the "...WRTP continued to discharge high quality effluent."

Sludge/Biosolids Generation

Activated sludge is removed from the system based on flow and solids concentration. The sludge is processed in an air flotation system prior to dewatering. The treated waste is then pumped to the filtration building at about 3-5% solids. The sludge can be directed to one or all three filter belt presses. Sludge cake from the belt presses is conveyed to an incinerator. The ash is collected at the bottom of the incinerator and transported by air to two storage silos. The incinerator is normally operated 24 hours a day, seven days a week. An average of 24.5 tons of sludge were incinerated a day in 2000. The operation is permitted for 48 dry tons. Sludge reduction by incineration is about 75%. The ash is permitted for disposal in the State of Delaware, and all ash generated is disposed of there.

The approximately 24.5 dry tons incinerated per day at the DELCORA plant include sludge from its own treatment processes as well as an additional 2 to 10 tons per day from contract customers. In accepting contract sludge, DELCORA gives preference to Delaware County facilities. DELCORA asks for a minimum of 4% solids in contract sludge and charges higher rates if the solids drop below that percentage. Each incinerator unit is permitted to burn 48 tons per day for a total of 96 tons per day for the facility.

Rose Valley Borough

Organizational Description

Rose Valley Borough Council is responsible for overseeing operation and maintenance of the treatment plant, pump stations, and sewers associated with these facilities. Since Rose Valley Borough is generally fully developed and no major expansion is expected, Borough activity focuses on maintaining and replacing existing infrastructure in order to control I&I issues.

Treatment Facility Description

The Rose Valley Sewage Treatment Plant (STP) is located off of Long Point Lane on Ridley Creek as shown in Figure 3-5. This facility, constructed in 1937, employs a trickling filter process and is designed to treat 0.13 MGD. Design organic load of the plant is 221 lbs. of BOD_5 per day. The plant is owned and operated by Rose Valley Borough under NPDES Permit No. PA0020575.

Previous Upgrades

There have been no recent upgrades to the plant.

Other Issues

The Rose Valley STP service area includes only residential properties. There are no industrial or commercial users discharging to the plant.

Insert Figure 3-5

Scheduled Upgrades

Plans are currently underway for an overhaul of the trickling filter at the plant.

Current Plant Status

The plant currently operates within its NPDES permit limits, below hydraulic and organic capacity. In 2000, the average dry-weather flow was 0.076 MGD, and the 3-month maximum average daily flow was 0.103 MGD.

Conveyance Facilities Description

Conveyance Lines

The 6.53 miles of sanitary sewers located in Rose Valley Borough are owned and maintained by the Rose Valley Department of Public Works.

Pump Stations

Rose Valley Borough currently operates and maintains three wastewater pump stations. Two of them (Long Point Lane Station and Old Mill Pump Station) transport the flow to the Rose Valley WWTP. Long Point Lane Station serves approximately eleven homes, while Old Mill Pump Station serves about 260 homes, operating two 250 gallon/minute (gpm) pumps. Brookhaven Road Station, located in the southern portion of town, conveys the flow from approximately 93 residences to DELCORA by means of two 125 gpm pumps.

Sludge/Biosolids Generation

Sludge generated at the Rose Valley STP is collected without dewatering and transferred directly to DELCORA's Chester facility for further treatment.

Southwest Delaware County Municipal Authority

Organizational Description

The Aston Board of Commissioners, pursuant to the Municipality Authorities Act, established the SWDCMA on December 16, 1957. The Aston Township Board of Commissioners appoints its seven-member Board of Directors. SWDCMA was authorized to exercise all powers granted under the Act to implement the wastewater management plan for its service area. SWDCMA's role as an implementation agency involves the acquisition, holding, construction, improvement, maintenance, operation, owning, and leasing of the sewer system and the sewer treatment facilities. SWDCMA is financially self-sufficient; capital funds are raised through bond issues while operations and maintenance expenses and debt service are covered by user charges. SWDCMA owns and maintains the 6 MGD

Baldwin Run Pollution Control Facility located in Aston, as well as an extensive system of wastewater conveyance facilities and, in certain municipalities, the collector sewers as shown in Figure 3-6.

Treatment Facility Description

The Baldwin Run Pollution Control Plant is located at the terminus of Gamble Lane and Park Lane in Aston. The plant was built in 1959 with an average design flow of 2.0 MGD. Secondary treatment was originally designed as a trickling filter plant but has since been changed to an aerated bio-filter with attached growth nitrification. Effluent is chlorinated and discharged to Chester Creek. The design BOD_5 of the facility is 12,510 lbs./day. The existing NPDES permit (No. PA0027383) identifies the effluent discharge limitation for the Baldwin Run Pollution Control Plant as 6 MGD. SWDCMA has plans to re-rate the plant for higher capacity.

Previous Upgrades

Since construction, the treatment plant has undergone a number of upgrades. The most recent upgrade included the installation of a new screening system (rotomat and grit classifier), the addition of two activated bio-filters (formerly trickling filters), the conversion of a tricking filter to a third primary clarifier, and the construction of a third final clarifier.

Other Issues

In 2000, the plant discharged an average of 5.54 MGD. The highest monthly average recorded was 6.43 MGD during April, and the highest 3-month average was 6.24 MGD (February to April). Daily average flows over 8 MGD were observed in 2000 with instantaneous peak flows in excess of 10 MGD. The highest instantaneous flows corresponded to specific precipitation events, indicating an I&I problem in the collection system. On October 5, 2001, SWDCMA was notified by DEP that it was to prohibit new connections in all areas and communities served by the Baldwin Run Pollution Control Plant. It was also directed to begin the planning, design, financing, construction, and operation efforts necessary to meet the anticipated demand. DEP directed that a corrective action plan be submitted within ninety days. In June 2002, DEP approved a proposed re-rate of the SWDCMA treatment facility. Per DEP requirement, this plan will follow the format of the standard Act 537 plan and will evaluate all municipalities served by SWDCMA.

Scheduled Upgrades

No upgrades are currently scheduled.

Current Plant Status

The highest 3-month average flow was 6.24 MGD, which exceeded the permitted capacity of 6 MGD. This prompted DEP to issue a ban on new sewer connections on

Insert Figure 3-6

October 5, 2001. In November 2001, SWDCMA prepared a corrective action plan addressing ways to provide hydraulic relief. The plan describes the I&I abatement program, proposed planning and design, and operational and maintenance procedures employed to prevent hydraulic overloading.

Conveyance Facilities Description

Conveyance Lines

SWDCMA owns and maintains approximately 63 miles of sanitary sewer lines as shown on Figure 3-6. This system includes two main delivery interceptors (Chester Creek Interceptor and Baldwin Run Interceptor) and eight siphons for creek crossings. SWDCMA also maintains approximately forty individual grinder pumps for single-family homes in its service area. Blockages and system failures resulted in three reported overflows in 2000. In addition, I&I problems resulted in thirteen reported overflows.

Pump Stations

SWDCMA owns and operates the following seven pump stations:

- District 4/Team Road PS
- Eagle Park PS
- Carriage Lane PS
- Woodbrook PS
- Toby Farms PS
- Concord Hills PS
- Village Green PS

Sludge/Biosolids Generation

Solids are collected at six locations in the treatment process: the aerated holding tanks, rotomat screens, grit chamber, primary clarifiers, final clarifiers, and filter presses. The screenings and grit from the rotomat screens and the grit chamber are sent to Pottstown Landfill. The solids from the clarification tanks, holding tanks, and the presses are digested in anaerobic digesters to reduce mass. After digestion, the remaining solids pass through a press with the resulting "cake" being sent to the Pottstown Landfill for disposal.

Thornbury Township

Organizational Description

There are currently three private treatment facilities permitted within Thornbury Township that serve more than a single residence. Information on these facilities is provided in a subsequent section. In addition to the NPDES permitted facilities, there are a significant

number of on-lot treatment systems in the Township, which will also be discussed in a subsequent section.

Treatment Facility Description

The Thornbury Township STP is located on Thornton Road as shown in Figure 3-7. This plant, which was constructed in 1991, is an activated sludge type facility designed to treat 0.06 MGD by a private land developer. In 1996, a second 0.06 MGD treatment train was constructed, increasing the permitted capacity to 0.12 MGD. The main treatment process involves an extended aeration activated sludge process with flow equalization. In 1998, ownership of the plant was transferred to Thornbury Township. The plant operates under NPDES Permit No. PA0053473. Its design organic capacity is 240 lbs. of BOD_5 per day.

Previous Upgrades

A 1994 expansion of the plant increased plant capacity from 0.06 MGD to its current 0.12 MGD.

Scheduled Upgrades

DEP approval has been granted for an expansion to 0.18 MGD, and the project is currently in the design phase.

Current Plant Status

The plant currently operates within its permit limits. Monthly average for the year 2000 was 0.056 MGD, with a 3-month maximum daily average at 0.062 MGD. Average monthly organic loading was 112 lbs. of BOD_5 per day.

Conveyance Facilities Description

Conveyance Lines

Thornbury Township Department of Public Works owns and maintains approximately 4,300 LF of sewers serving the Cherry Farm development and transporting wastewater to Concord. Public conveyance systems currently serving the Thornbury Treatment Plant contain approximately 25,200 LF of sewers. Residential development on the eastern side of the Township will lengthen conveyance systems by about 20,200 LF outside of those developments, with collection system length inside the developments reaching 22,220 LF.

Pump Stations

There are currently seventeen sewage pump stations in Thornbury Township. Of these, Thornbury Township currently owns and operates Thornbury Hunt (#1 and #2) and

Insert Figure 3-7

Cobblestones (#1 and #2) Pump Stations with the remainder being privately owned and operated.

Sludge/Biosolids Generation

Thornbury Treatment Plant sludge is not dewatered on site. The sludge is removed by EarthCare and hauled to the DELCORA and SWDCMA facilities for further treatment.

City of Wilmington

Organizational Description

The City of Wilmington Department of Public Works is responsible for wastewater collection and treatment in the City and surrounding areas.

Treatment Facility Description

The Wilmington Water Pollution Control Facility is owned by the City of Wilmington and operated by U.S. Filter. The plant was built in 1954 for the City of Wilmington. The City of Wilmington and U.S. Filter are co-holders of NPDES Permit No. DE0020320 to discharge into the Delaware River. The plant's current treatment capacity is 134 MGD, with a 19,080 lbs. of BOD_5 daily average and a 38,160 lbs. of BOD_5 daily maximum. The facility employs a standard secondary activated sludge process. The tertiary ponds serve as a capture point for stormwater/rain event bypasses of the system.

Previous Upgrades

Several rounds of upgrades were undertaken at the plant in 1976, 1986, and 1992.

Other Issues

The plant functions very effectively slightly below design flows. As design flows (134 MGD) are approached, poor flow distribution of the secondary system causes some solids loss in the tanks that have high flow rates.

The facility has twenty-two permitted industrial contributors, such as pharmaceutical, metal finishing, paper and pulp, and power station clients. Several industrial contributors (including Allied Signal and Honeywell) are located in southern Delaware County and have direct connection to a pump station in Claymont, DE.

Scheduled Upgrades

No upgrades are scheduled at this time. There exists a possibility of some changes required for combined sewer overflow (CSO) abatement in the future.

Current Plant Status

The plant has had storm flows in excess of 300 MGD for short periods of time during rain events. In the last year, the highest flow value has been in the range of 90 MGD, with peak flow of 250 MGD. All NPDES permit requirements for 3-month maximum daily average and monthly average have been met.

Conveyance Facilities Description

Conveyance Lines

Currently, three conveyance lines transport wastewater from Delaware County to New Castle County, DE. One line conveys sewage from SDCA, and two lines convey wastewater from Bethel Township. Several small industrial wastewater lines transport sewage from Pennsylvania to the Wilmington Wastewater Plant.

Pump Stations

Wastewater from SDCA is transported to the Wilmington Wastewater Plant by the Naamans PS, while both lines from Bethel Township enter Brandywine Town Center PS.

Sludge/Biosolids Generation

After initial dewatering, sludge is stored at the plant for additional drying and stabilization. When this is complete, the biosolids are then disposed of at a landfill or applied as landfill cover by an independent contractor. The disposal facility currently being used is Delaware Solid Waste Authority's Northern Solid Waste Management Center (Cherry Island Landfill) in Wilmington, DE.

Summary

Currently, there are eight publicly-owned treatment facilities serving western Delaware County, one of which is located in the State of Delaware. Table 3-2 provides a summary of the publicly-owned facilities.

Wastewater Conveyance Authorities

Bethel Township Sewer Authority

The Bethel Township Sewer Authority (BTSA) was formed in 1973. It currently has five Board members. The Authority oversees the Township's conveyance facilities

TABLE 3-2

SUMMARY OF PUBLICLY-OWNED TREATMENT FACILITIES SERVING WESTERN DELAWARE COUNTY

Facility	Owner/Operator	NPDES Permit No.	Receiving Water	Permit Capacity (MGD)	Avg. Flow (MGD)	Maximum 3-Month Avg. Flow (MGD)	Avg. / Peak BOD_5 Load (lbs/day)	BOD_5 Design Load (lbs/day)
Western Regional Treatment Plant	DELCORA	PA0027103	Delaware River	44	31.2	35.6	1,292 / 24,255	91,740
Baldwin Run Pollution Control Plant	SWDCMA	PA0027383	Chester Creek	6	5.54	6.24	8,203 / 11,018	12,510
Brookhaven Wastewater Treatment Plant	Brookhaven Borough / Public Works	PA0023949	Chester Creek	0.192	0.169	0.201	236 / NA	320
Ridings Wastewater Treatment Plant	Chadds Ford Township	PA0055476	Unnamed Trib. of Harvey Run	0.080	0.011	0.022	NA / NA	167
Central Sewage Treatment Plant	Concord Twp. Sewer Authority	PA0055212	W. Br. Chester Creek	1.2	0.357	0.386	1,000 / 1,500 (est)	2,500
Rose Valley Sewage Treatment Plant	Rose Valley Borough / Public Works	PA0020575	Ridley Creek	0.130	0.076	0.103	102 / 124 (1999)	221
Thornbury Township Treatment Plant	Thornbury Township / American Water Services	PA0053473	Unnamed Trib. to Chester Cr.	0.120	0.056	0.062	112 / 142	240
Wilmington Water Pollution Control Facility	City of Wilmington / US Filter	DE0020320	Delaware River	134	78.8	86.2	9,350 / 64,363	19,080

Source: U.S. EPA EnviroFacts Database and DEP files, 2003

which include about ten miles of sewers and several pump stations as depicted on Figure 3-8. The wastewater is currently conveyed to SDCA.

Middletown Township Sewer Authority

Middletown Township Sewer Authority (MTSA) was formed in the late 1960s and has been historically delegated with the responsibility of developing and implementing all plans for sewage facilities as directed by Township Council. MTSA is currently a "Lease Back Authority" and provides conveyance of wastewater (Figure 3-9), oversight of alternative disposal facilities, and sewer planning in the Township. MTSA transports its wastewater flows to SWDCMA.

Newtown Township Municipal Sewer Authority

The Newtown Township Municipal Sewer Authority was formed in the mid-1950s. The Authority has a five-member Board responsible for overseeing the Township's sewage conveyance facilities, which include gravity lines and pump stations that connect to RHM, as shown in Figure 3-10.

Southern Delaware County Authority

SDCA's member municipalities are Upper Chichester and Bethel Townships. The Authority was organized in 1954 and has five Board members. The Authority's service area covers portions of the Marcus Hook Creek, Naamans Creek, and Bezor's Run watersheds. It maintains 65 miles of sewers and five interceptors as shown in Figure 3-11.

Approximately 1.5 MGD of sewage formerly conveyed to the New Castle County Authority's system to be treated at the City of Wilmington Water Pollution Control Plant has been diverted to DELCORA's WRTP effective March 20, 2002. Per an agreement with SWDCMA, additional flows are treated at the Baldwin Run Plant in Aston Township. An amendment to SDCA's 537 Plan which was submitted to and approved by DEP redirected approximately 0.8 MGD from SWDCMA's Baldwin Run Pollution Control Plant to DELCORA's WRTP. Currently, only about 613 equivalent dwelling units (EDUs) from SDCA's collection system are treated at SWDCMA's plant.

Upper Providence Township Sewer Authority

Upper Providence Township Sewer Authority (UPTSA) was formed under the provisions of the Municipality Authorities Act on May 15, 1979, establishing a seven-member Board. UPTSA was authorized to exercise all powers granted under the Act to implement the wastewater management plan for its service area. UPTSA maintains over ten miles of sewer lines as shown in Figure 3-12. Wastewater from most of the sewered areas is transported to the Aqua Pennsylvania, Inc. Media WWTP (previously owned by the Borough of Media). Several single residences in Upper Providence Township are

Insert Figure 3-8

Insert Figure 3-9

Insert Figure 3-10

Insert Figure 3-11

Insert Figure 3-12

individually connected to CDCA's and Rose Valley Borough's sewer systems. UPTSA does not operate any treatment facilities itself. Fifteen single residences operate individual package plants in place of failed on-lot systems. UPTSA inspects those systems regularly and plans to connect many of the residences to public sewer in the near future. One community treatment facility (Tofts Woods Treatment Plant) is operated and maintained by a private contractor.

New Castle County

New Castle County Department of Special Services is responsible for operating and maintaining public sewer lines and lift stations. Currently one pump station transports wastewater from Delaware County to Delaware, the Brandywine Town Center Station in Bethel Township.

PRIVATE ORGANIZATIONS PROVIDING SEWAGE TREATMENT AND CONVEYANCE WITHIN THE WESTERN STUDY AREA

There are a number of private wastewater treatment facilities located in western Delaware County that serve more than one single-family residence. The available information on the particular facilities varies because DEP reporting requirements are different for small, privately-owned facilities. The facility NPDES permit requires a discharge monitoring report like all other publicly-owned facilities, but otherwise there is limited reporting. Some municipalities have developed inspection requirements and maintain some information on these facilities. The following facilities are located on the individual municipal maps shown previously. The facility servicing Media Borough was until recently a publicly-owned and operated facility. As such, considerably more information is currently available about the plant and collection system than is available for the smaller community systems that serve residential developments.

Media Borough

Organizational Description

Philadelphia Suburban's Little Washington Wastewater Company (now Aqua Pennsylvania, Inc.) purchased the Media Borough Treatment Plant and collection system from the Borough in 2001.

Treatment Facility Description

The plant was constructed in 1937 and currently operates under NPDES Permit No. PA0024121. Design capacity of the plant is 1.8 MGD. The plant is located in Upper Providence Township and discharges treated water into Ridley Creek. The plant (shown in Figure 3-13) accepts wastewater from Media Borough, parts of Upper Providence Township, and Elwyn Institute.

Previous Upgrades

The last major expansion of the plant was completed in 1988 and concerned primary and secondary processes that were converted from a trickling filter to a conventional activated sludge process with nitrification removal.

Other Issues

There is currently a self-imposed moratorium on multiple connections from Upper Providence, Elwyn, and Media. Several approvals were granted to Upper Providence conditionally upon the reduction of I&I.

Scheduled Upgrades

No upgrades are scheduled for the Media Plant at this time.

Current Plant Status

The annual average flow at the Media Plant in the year 2000 was 1.50 MGD, with a 3-month maximum flow of 1.63 MGD.

Conveyance Facilities Description

Conveyance Lines

I&I problems in aging infrastructure are the main issues for the public sewer system in Media. Aqua Pennsylvania, Inc. is working on an I&I abatement program.

Pump Stations

There are three pump stations currently operating within the Borough sewage system:

- Lemon Street PS
- Lincoln Street PS
- Orange Street PS

One station (Elwyn) is currently not in operation.

Sludge/Biosolids Generation

A majority of sludge generated in the plant (about 95%) is dewatered using a felt press and hauled to a landfill. About 5% of the sludge in liquid form is hauled to DELCORA using a 4,000-gallon truck.

Insert Figure 3-13

Chadds Ford Township

There are currently six small community treatment systems in Chadds Ford Township, of which three are stream discharges and three discharge to an absorption field. These treatment facilities, shown in Figure 3-3, are:

- Knight's Bridge WWTP
- Pantos WWTP
- Springhill Farms WWTP
- Brandywine Summit WWTP
- Brandywine River Hotel WWTP
- Ravens Crest WWTP

The Chadds Ford Township Engineer conducts regular inspections of the treatment facilities to ensure proper maintenance and operation.

Chester Heights Borough

There are currently three small community treatment systems in Chester Heights Borough that have stream discharges. These treatment facilities, shown in Figure 3-14, are:

- Coventry Crossing WWTP
- Darlington Woods WWTP
- Valleybrook WWTP

Concord Township

There are currently nine small community treatment systems in Concord Township which all have stream discharges. The CTSA contracts regular inspections of the treatment facilities to ensure proper maintenance and operation. These treatment facilities, shown in Figure 3-4, are:

- Brinton Manor Sewage Plant
- Concord Beverage Sewage Plant
- Concord Country Club Sewage Plant
- Concord Industrial Park Sewage Plant
- Concordville Inn Sewage Plant
- Fox Valley Sewage Plant
- Garnet Valley School District Sewage Plant
- Southco STP
- State Farm STP

There are currently nineteen private treatment facilities permitted within Concord Township, ten serving single residences, one serving a residential community, seven serving industrial/commercial establishments, and one serving an industrial park. Information on these facilities is provided in a subsequent section. In addition to the NPDES permitted facilities, there are a significant number of on-lot treatment systems in the Township, which will also be discussed in a subsequent section.

Edgmont Township

There are currently ten small community treatment systems in Edgmont Township. These treatment facilities, shown in Figure 3-15, are:

- Sleighton Farm School STP
- Runnymeade Farm Development – 3 facilities
- U.S. Army Reserve Center Treatment Plant
- White Horse Village Treatment Plant
- Edgmont Square Center – 2 facilities
- Eagleview Treatment Plant
- Edgmont Country Club Treatment Plant

Runnymeade utilizes a community on-lot disposal system for Phases 2 and 3, and two large-volume on-lot systems for Phases 4, 5, and 6. Edgmont Square Center systems currently serve a movie theater, retail shops, and an office complex. One of the systems currently has compliance problems and is forced to haul wastewater off-site for treatment and disposal. The recent Act 537 Plan prepared by Edgmont Township proposes replacing facilities serving Runnymeade Farm Planned Residential Development (PRD) and Edgmont Square Center with a central wastewater conveyance system to the proposed wastewater facilities in Newtown Township (Old Masters Golf Course STP).

Newtown Township

There is currently one small community treatment system shown in Figure 3-10, Springton Pointe Estates Treatment Plant located in Newtown Township, which is a land application treatment system. An NPDES permit has been issued by DEP to Joyfor Joint Venture, located in Edgmont Township, to construct a 0.05 MGD wastewater treatment facility to serve a proposed shopping center and hotel located northeast of PA Route 3 and Providence Road in Newtown Township.

Similarly, an NPDES permit has been issued to Aqua Pennsylvania, Inc. to construct the 0.085 MGD Somerset Treatment Plant off of Gradyville Road to serve a proposed office building and a retirement community. However, a recent Act 537 Update proposes utilizing CDCA's disposal facility, which will eliminate the need for the Somerset facility and make it possible to abolish the existing Springton Pointe Estates Plant. The same plan also proposes construction of a new subsurface disposal facility, the Old Masters Golf Course STP.

Insert Figure 3-14

Insert Figure 3-15

Thornbury Township

There are currently three small community treatment systems in Thornbury Township that have stream discharges. These treatment facilities, shown in Figure 3-7, are:

- Cheney University Treatment Plant
- Glen Mills School Treatment Plant
- Goddard School Treatment Plant

Upper Providence Township

There is currently one small community treatment system shown in Figure 3-12, Toft Woods Treatment Plant located in Upper Providence Township, that has a subsurface discharge.

Summary

There are currently thirty-four active and five proposed private treatment facilities operating in western Delaware County. There is only one private plant that is permitted at more than 0.35 MGD (Media – 1.8 MGD) and six plants permitted between 0.1 – 0.35 MGD. The remaining twenty-seven private plants are permitted at less than 0.075 MGD. Table 3-3 provides a summary of these plants.

TABLE 3-3

SUMMARY OF PRIVATELY-OWNED TREATMENT FACILITIES IN WESTERN DELAWARE COUNTY

Facility	Owner	Operator	NPDES or DEP Permit No.	Receiving Water	Permit Capacity (MGD)[1]
Chadds Ford Township					
Knight's Bridge WWTP	Knight's Bridge Corp.	American Water Services	PA0052663	Harvey Run	0.045
Pantos WWTP	Pantos Corp.	American Water Services	PA0047252	Harvey Run	0.070
Springhill Farms WWTP	Springhill Farms Wastewater Facility Assoc.	American Water Services	PA0052230	Unnamed trib. to W. Br. Chester Creek	0.100
Brandywine River Hotel WWTP	3 Tem Hotels, Inc.	D. Benner	N/A	Subsurface absorption	0.0048
Brandywine Summit WWTP	Brandywine Summit Partners	R. Eshelman	N/A	Subsurface absorption	0.006475
Raven's Crest WWTP	Raven's Crest Homeowners Assoc.	D. Benner	N/A	Subsurface absorption	0.005
Chester Heights Borough					
Coventry Crossing Treatment Plant	Pantos Corp.	American Water Services	PA0052434	Unnamed trib. to W. Br. Chester Creek	0.040
Darlington Woods Treatment Plant	Darlington Woods Homeowners Assoc.	American Water Services	PA0050237	E. Br. Chester Creek	0.150
Valleybrook Treatment Plant	Valleybrook Homeowners Assoc.	American Water Services	PA0040576	W. Br. Chester Creek	0.072

TABLE 3-3

SUMMARY OF PRIVATELY-OWNED TREATMENT FACILITIES IN WESTERN DELAWARE COUNTY (CONTINUED)

Concord Township					
Brinton Manor Sewage Plant	Genesis Eldercare	American Water Services	PA0044474	W. Br. Chester Creek	0.013
Concord Beverage Treatment Plant	Concord Beverage LP	self	PA0050431	Unnamed trib. to W. Br. Chester Creek	
Concord Country Club Sewage Plant	Concord Country Club	American Water Services	PA0031666	Unnamed trib. to W. Br. Chester Creek	0.0125
Concord Industrial Park Sewage Plant	Am. Commonwealth Management Services	American Water Services	PA0032301	W. Br. Chester Creek	0.020
Concordville Inn Sewage Plant	Concordville Inn	Brian Norris	PA0052744	Unnamed trib. to W. Br. Chester Creek	0.025
Fox Valley Sewage Plant	Fox Valley Community Services	TMH Environmental Services	PA0030431	W. Br. Chester Creek	0.074
Garnet Valley School District Sewage Plant	Garnet Valley School District	American Water Services	PA0031208	Green Creek	0.0222
Southco Sewage Treatment Plant	SOUTHCO, Inc.	American Water Services	PA0051161	W. Br. Chester Creek	0.013
State Farm Sewage Treatment Plant	State Farm Mutual Auto Insurance Co.	American Water Services	PA0051756	W. Br. Chester Creek	0.025

TABLE 3-3

SUMMARY OF PRIVATELY-OWNED TREATMENT FACILITIES IN WESTERN DELAWARE COUNTY (CONTINUED)

Facility	Owner	Operator	NPDES or DEP Permit No.	Receiving Water	Permit Capacity (MGD)[1]
Edgmont Township					
Runnymeade Farm Sewage Treatment Plant #1	Holloway Development Corp.		N/A	Subsurface absorption	0.053
Runnymeade Farm Sewage Treatment Plant #2	Holloway Development Corp.	American Water Services	2387424	Subsurface absorption	0.034
Runnymeade Farms Sewage Treatment Plant, phase 5	Holloway Development Corp.	Suburban Wastewater Services	2388416	Subsurface absorption	
Sleighton Farm School Sewage Treatment Plant	Sleighton School for Girls	Steve Cawley	PA0029980	Rocky Run	0.150
U.S. Army Reserve Center Treatment Plant	U.S. Government		N/A	Terminated discharge	0.00625
White Horse Village Treatment Plant	White Horse Village, Inc.	TMH Environmental Services	2300404	Ridley Creek	0.046
Eagleview Treatment Plant	Eagleview Homeowners		N/A	Subsurface absorption	0.0055
Edgmont Country Club Treatment Plant	Edgmont Country Club		N/A	Subsurface absorption	0.0088
Edgmont Square Center #1	Claude Debotton	Brian Norris	2398407	Subsurface absorption	0.0033

TABLE 3-3

SUMMARY OF PRIVATELY-OWNED TREATMENT FACILITIES IN WESTERN DELAWARE COUNTY (CONTINUED)

Facility	Owner	Operator	NPDES or DEP Permit No.	Receiving Water	Permit Capacity (MGD)[1]
Edgmont Square Center #2 (Regal Theater)	Claude Debotton	American Water Services	2396405	Subsurface absorption	0.0011
Edgmont Square Center #3	Proposed Facility		N/A	Subsurface absorption	
Media Borough					
Media Sewage Treatment Plant	Aqua Pennsylvania, Inc.	Aqua Pennsylvania, Inc.	PA0024121	Ridley Creek	1.800
Newtown Township					
Springton Pointe Estates Treatment Plant	Proposed Facility	Jim Byham	2394406	Subsurface absorption	0.350
Somerset	Aqua Pennsylvania, Inc.	Aqua Pennsylvania, Inc.	PA0058262	Hunter Run	0.085
Joyfor Joint Venture Proposed Facility	Proposed Facility		PA0057924	Wetlands to Reese's Run	0.05
Brandywine Operating Partnership (11 Campus)	Proposed Facility	Tom Cosgrove	2398405	Subsurface absorption	
Brandywine Operating Partnership (17 Campus)	Proposed Facility	Tom Cosgrove	2398406	Subsurface absorption	
Thornbury Township					
Cheney University Treatment Plant	Cheney University of PA	Jim Byham	PA0030970	E. Br. Chester Creek	0.270

TABLE 3-3

SUMMARY OF PRIVATELY-OWNED TREATMENT FACILITIES IN WESTERN DELAWARE COUNTY (CONTINUED)

Facility	Owner	Operator	NPDES or DEP Permit No.	Receiving Water	Permit Capacity (MGD)[1]
Glen Mills School Treatment Plant	Glen Mills School	American Water Services	PA0031747	E. Br. Chester Creek	0.150
Goddard School Treatment Plant	Goddard School	Steve Cawley	PA0056821	E. Br. Chester Creek	0.0025
Upper Providence Township					
Toft Woods Treatment Plant	Toft Woods Homeowners Assoc.			Subsurface absorption	0.015

[1] Design capacity for subsurface absorption disposal systems shown as appropriate.

Source: U.S. EPA EnviroFacts Database and DEP files

CHAPTER 4

EVALUATION OF WASTEWATER TREATMENT NEEDS

INTRODUCTION

One of the most important components of a sewage facilities plan is an analysis of sewage treatment needs. While some portions of western Delaware County have an extensive public sewer system, others continue to rely heavily on individual on-lot subsurface or community sewage treatment systems.

During spring 2000, DCPD conducted a survey to determine the extent and location of on-lot sewers in the western municipalities. Only eight of the fourteen municipalities responded to the survey, with two of them noting that less than 1% of homes and businesses within their municipal boundaries use on-lot disposal systems (OLDS). Information presented in this chapter was based on this survey as well as on additional interviews with municipal officials and SEOs conducted in December 2001 and January 2002.

ON-LOT SUBSURFACE SEWAGE DISPOSAL SYSTEMS

Location of On-Site Systems

Aston Township

Most of Aston Township is serviced by public sewers. Only about 1% of homes and businesses use individual on-lot systems. Community on-lot systems account for another 1% of residences and businesses. Most on-lot facilities are located in the northwestern part of the Township along Mount Road and in the southeastern part along Duttons Mill Road. These facilities do not show any signs of problems at the present time; however, the age of the systems is a concern.

Bethel Township

About 10% of homes and businesses in Bethel Township are serviced by individual on-lot systems, and there are no known community on-lot systems. According to the results of the SEO survey, reported malfunctions were caused by age, poor soils, and lack of proper maintenance. High groundwater tables are characteristic for parts of the Township, increasing the risk of subsurface water contamination.

Brookhaven Borough

No information provided.

Chadds Ford Township

No information provided.

Chester Heights Borough

About 75% of residences and businesses in Chester Heights Borough are serviced by individual on-lot systems. One community facility (Darlington Woods) holds an NPDES permit and discharges into the East Branch of Chester Creek. Two other community systems (Coventry Crossing and the Village of Valleybrook) have on-site disposal of treated wastewater and, thus, do not hold NPDES permits. On-lot systems that experience problems are typically located in low spots near streams. Soils in the Borough are generally acceptable for on-lot systems. Known on-lot system replacements included old septic tanks (installed prior to 1967) and those that were poorly maintained. The main threat to groundwater is posed by cesspools, which are generally a minimum of 8 feet deep.

Concord Township

Concord Township is currently experiencing a surge in development. At the present time, about half of the municipality's residences and businesses are still using individual on-lot sewage systems. One commercial and one residential development use community treatment plants. Several areas in the Township are experiencing on-lot problems. They include areas adjacent to Kirk Road and Shavertown Road and the Conestoga Farms development. Planning for public sewer installation is in progress to resolve some of these problems.

Edgmont Township

Edgmont Township relies entirely on on-lot systems. Some residential and business developments (Runnymeade, Edgmont Square Center) have privately maintained large volume community on-lot disposal facilities; however, most individual residences employ on-lot systems. These systems generally function well due to large lot size and good soil conditions. There are a few problem areas, such as the Castle Rock development, which is characterized by small lot sizes. One of Edgmont Square Center's facilities is currently hauling wastewater for off-site disposal due to compliance problems. The Township's general approach is to continue employing on-lot systems wherever possible, thus providing additional recharge to groundwater aquifers.

Media Borough

Media Borough is almost entirely built out. Current development is mostly limited to redevelopment of already sewered areas. Only three lots in the Borough, all located along West End Avenue, use on-lot systems. All three are experiencing overflow problems, mostly due to system age and soil limitations. Their small lot size restricts the types of repairs available.

Middletown Township

Most of Middletown Township is sewered, with only about 2% (about 300 homes) utilizing on-lot systems. There are no community on-lot systems. Some individual systems

are characterized by malfunctions, such as those along New Darlington and Valley Roads, due to location in low areas. Given the limited connections available to SWDCMA, some Middletown builders received permission to employ temporary on-lot systems. Tie-in of all residences located within 150 feet of public sewer connection will become mandatory, and temporary on-lot systems will be abandoned once capacity becomes available at SWDCMA.

Newtown Township

A significant number of residences in Newtown Township rely on on-lot systems for wastewater disposal. Several of these on-lot systems have historically or are currently experiencing malfunctions. Some problems have been eliminated by public sewer system extension (Newtown Heights/Elgin Park), while others are generally dealt with by repair, enlargement, upgrading, or installation of replacement systems.

Rose Valley Borough

Rose Valley Borough is nearly built out with only one property remaining with subdivision potential. Public sewers service most of the Borough, while only 10% of residences use individual on-lot systems. These pockets of on-lot systems remain primarily due to economic unfeasibility of extending public sewers to these areas. There are no on-lot systems within Rose Valley currently experiencing any problems. All maintenance issues are resolved promptly, and systems continue to operate effectively. One property directly adjacent to the Borough line but located in Nether Providence Township has experienced chronic on-lot problems, but the ability to make repairs is limited due to its small lot size.

Thornbury Township

Approximately 65% of the Township utilized on-lot disposal systems in the year 2000. Malfunctions were rare, and the cause of the failure varied. Most of the residences are located on at least 2-acre lots, which generally accommodate both an on-lot system and a well for water supply comfortably. Problems usually arise due to the age of the system or poor maintenance.

Upper Chichester Township

Upper Chichester is practically built out. Less than 1% of all residences and businesses are served by on-lot sewer systems, and there are no known community on-lot systems. Whenever existing on-lot systems are found to experience problems due to their age, poor soils, or lack of maintenance, they are connected to nearby public sewer where available. Very limited, isolated areas along the U.S. Route 322 corridor do not have direct access to public sewer. Many of these sections could connect if required through the use of grinder pumps with long lines, long gravity extensions, or extensive work within the state highway. However, this could prove costly for isolated single residences.

Upper Providence Township

Upper Providence Township is actively developing its public sewer system; however, approximately 45% of all residences still use an on-lot system for wastewater disposal. The municipal survey reported that some systems were experiencing malfunctions due to poor soils and small lot sizes. One area in particular, located adjacent to Old State Road, has been experiencing severe problems with on-lot systems. Most of the residences located in the northern part of the municipality (north of Route 1 – Media Bypass) are situated on large size lots and have suitable soils and, therefore, experience very few problems. Problems that do occur in the northern part of the Township are attributed to the age of the systems, and many of the disposal systems (up to 50%) were recently replaced with new ones due to strict home resale and system certification requirements. Several residents have installed small volume package plants on their properties. These plants are inspected annually by the Township, and reports are submitted to DEP.

On-Site System Management and Maintenance

None of the fourteen western municipalities with on-site systems noted that they had ordinances requiring septic tank maintenance or inspection at specified intervals. Upper Providence Township currently has a draft of such an ordinance pending approval. Few municipalities have any educational programs regarding on-lot system suitability and maintenance.

Survey responses indicated that septic tank cleaning and septage hauling services are privately contracted by homeowners. Sewage sludge in western Delaware County is generally hauled to SWDCMA, DELCORA, or PSWPCP for disposal. However, municipalities have no requirements on disposal destinations or hauling records.

SUITABILITY FOR ON-SITE SYSTEMS

In order to determine the suitability of areas for on-site systems, a number of physical factors must first be examined. This section addresses the factors most influential in the siting of on-site systems, including soil characteristics, slopes, floodplains, wetlands, topography, and geology.

This information is provided here for planning purposes only and is not intended for use as a basis for determining the suitability of subsurface systems for any given tract of land. For a preliminary determination of soil suitability, please consult the *Soil Survey of Chester and Delaware Counties* and any updates available from NRCS. Field testing observed or conducted by a certified SEO is needed for final determination of suitability.

Soils

The ability of soil to physically, chemically, and biologically renovate sewage varies with its soil characteristics affecting drainage and permeability, including depth to

bedrock and depth of the seasonal high water table. Water percolation rates are an important parameter that determines how fast wastewater will enter the soil below the drain field. If percolation is too slow, the septic system may back up; if percolation is too fast, poor treatment of the effluent may result. Current conventional on-lot system standards require a minimum depth of 20 inches of suitable soil for good renovation purposes. Therefore, a high water table and shallow bedrock must be avoided to achieve such standards and ensure proper treatment of effluent.

Soil characteristics information can be found in general form in the U.S. Department of Agriculture's *Soil Survey of Chester and Delaware Counties* and in the *DEP Technical Manual for Sewage Enforcement Officers*. However, older surveys should be used with caution since some data had been altered in recent years after additional research. The 1963 *Soil Survey of Chester and Delaware Counties* was based on the field data collected in the late 1940s and early 1950s. This field data often concentrated on potential agricultural uses of the soils, while limited information was provided for engineering applications such as septic systems. Additional data collected throughout the years was archived in Ames, IA in the Iowa State University Soil Survey Database. In 1995, new tables rating soil suitability for a variety of uses were generated. Depending on restrictions such as flooding, depth to bedrock, ponding, depth to high water table, permeability, and slope, limitations for septic systems were rated as slight, moderate, and severe. These new ratings differ from those in the 1963 *Soil Survey of Chester and Delaware Counties* in some cases, based on newly acquired information. Table 4-1 lists soils in western Delaware County and their limitations for septic system installation and specifies restrictions that defined the limitation. Soil limitations for on-lot disposal systems in western Delaware County are depicted on Figure 4-1. This latest suitability data will be incorporated into the new Delaware County Soil Survey, which is due to be published by 2007.

The suitability data provided by soil surveys and the State's soil survey database should be used for overview purposes only. Any developer or homeowner desiring to site a new or replacement on-site system should contact the respective municipal SEO for a determination as to the suitability for an on-site system at a specific location.

Slopes

Residential and commercial development in areas of steep slopes creates problems for the use of on-lot disposal systems. Sewage effluent may be difficult or impossible to control and may result in pollution of the surface and groundwater. The extra weight of buildings and effluent from on-lot systems, in combination with the erosion, flooding, and sedimentation that may take place from construction on steep slopes, may cause slope failure and slumping if the soil becomes saturated. This can cause damage to development both on the slope itself and on areas downslope. Shallow soils frequently encountered in areas of steep slopes make OLDS and drainage facilities difficult to install.

TABLE 4-1

SOIL LIMITATIONS FOR ON-LOT DISPOSAL SYSTEMS

Symbol	Soil Name	Limitations	Restriction 1	Restriction 2	Restriction 3
BeA	Beltsville silt loam	Severe	Wetness	Slow permeability	
BeB2		Severe	Wetness	Slow permeability	
BrB2	Brandywine loam	Severe	Poor filter		
BrC		Severe	Poor filter		
BrC2		Severe	Poor filter		
BrC3		Severe	Poor filter		
BrD		Severe	Poor filter	Slope	
BrD2		Severe	Poor filter	Slope	
BrD3		Severe	Poor filter	Slope	
BrE		Severe	Poor filter	Slope	
BsB	Brandywine very stony loam	Moderate	Slow permeability		
BsD		Severe	Slope		
BsF		Severe	Slope		
ByA	Butlertown silt loam	Severe	Wetness	Slow permeability	
ByB2		Severe	Wetness	Slow permeability	
CaA	Calvert silt loam	Severe	Wetness	Slow permeability	
CaB		Severe	Wetness	Slow permeability	
CaB2		Severe	Wetness	Slow permeability	
CdA	Chester silt loam	Moderate	Slow permeability		
CdA2		Moderate	Slow permeability		
CdB		Moderate	Slow permeability		
CdB2		Moderate	Slow permeability		
CdC		Moderate	Slow permeability	Slope	

TABLE 4-1

SOIL LIMITATIONS FOR ON-LOT DISPOSAL SYSTEMS (CONTINUED)

CdC2		Moderate	Slow permeability	Slope	
Ch	Chewacla silt loam	Severe	Flooding	Wetness	Poor filter
CkB2	Chrome gravelly silty clay loam	Severe	Depth to rock		
CkC2		Severe	Depth to rock		
CkC3		Severe	Depth to rock		
CkD2		Severe	Depth to rock	Slope	
CkD3		Severe	Depth to rock	Slope	
Cn	Congaree silt loam	Severe	Flooding		
CoA	Conowingo silt loam	Severe	Wetness	Slow permeability	
CoB2		Severe	Wetness	Slow permeability	
GeA	Glenelg channery silt loam	Moderate	Slow permeability	Large stones	
GeA2		Moderate	Slow permeability	Large stones	
GeB		Moderate	Slow permeability	Large stones	
GeB2		Moderate	Slow permeability	Large stones	
GeB3		Moderate	Slow permeability	Large stones	
GeC		Moderate	Slow permeability	Slope	
GeC2		Moderate	Slow permeability	Slope	
GeC3		Moderate	Slow permeability	Slope	
GeD		Severe	Slope		
GeD2		Severe	Slope		
GeD3		Severe	Slope		
GeE		Severe	Slope		
GeE3		Severe	Slope		

TABLE 4-1

SOIL LIMITATIONS FOR ON-LOT DISPOSAL SYSTEMS (CONTINUED)

GnA	Glenville silt loam	Severe	Wetness	Slow permeability	
GnB		Severe	Wetness	Slow permeability	
GnB2		Severe	Wetness	Slow permeability	
GnC2		Severe	Wetness	Slow permeability	
GsB	Glenville very stony silt loam	Severe	Wetness	Slow permeability	
Ma	Made land	Not classified			
Mc		Not classified			
Md		Not classified			
Me		Moderate	Slow permeability		
MgB2	Manor loam	Moderate	Slow permeability		
MgB3		Moderate	Slow permeability		
MgC		Moderate	Slow permeability	Slope	
MgC2		Moderate	Slow permeability	Slope	
MgC3		Moderate	Slow permeability	Slope	
MgD		Severe	Slope		
MgD2		Severe	Slope		
MgD3		Severe	Slope		
MhE	Manor loam and channery loam	Severe	Slope		
MhE3		Severe	Slope		
MkF	Manor soils	Severe	Slope		
MmD	Manor very stony loam	Severe	Slope		
MmF		Severe	Slope		
Mn	Melvin silt loam	Severe	Flooding	Wetness	

TABLE 4-1

SOIL LIMITATIONS FOR ON-LOT DISPOSAL SYSTEMS (CONTINUED)

MoB2	Montalto channery silt loam	Severe	Slow permeability		
MrD	Montalto very stony silt loam	Severe	Slow permeability	Slope	
NaA	Neshaminy gravelly silt loam	Severe	Slow permeability		
NaB2		Severe	Slow permeability		
NaC2		Severe	Slow permeability		
NaC3		Severe	Slow permeability		
NaD		Severe	Slow permeability	Slope	
NaD3		Severe	Slow permeability	Slope	
NsB	Neshaminy very stony silt loam	Severe	Slow permeability		
NsD		Severe	Slow permeability	Slope	
NsF		Severe	Slow permeability	Slope	
OtA	Othello silt loam	Severe	Wetness	Slow permeability	
SaA	Sassafras loam	Severe	Slow permeability		
SaB2		Severe	Slow permeability		
WaA	Watchung silt loam	Severe	Wetness	Slow permeability	
We	Wehadkee silt loam	Severe	Flooding	Wetness	
WnA	Woodstown loam	Severe	Wetness	Slow permeability	
WoA	Worsham silt loam	Severe	Wetness	Slow permeability	
WoB		Severe	Wetness	Slow permeability	
WoB2		Severe	Wetness	Slow permeability	
WsB	Worsham very stony silt loam	Severe	Wetness	Slow permeability	

Source: U.S. Department of Agriculture, *Soil Survey of Chester and Delaware Counties*, 1963

The steep slopes found in western Delaware County often parallel the County's stream channels. Extensive areas of slopes in excess of 15% are found in several locations throughout the County.

Floodplains

All of the major creeks that traverse Delaware County overflow their banks from time to time. The Federal Emergency Management Agency (FEMA) has prepared maps indicating areas that are inundated by a 100-year flood event. The FEMA map panels are available at the administration building in each municipality and at DCPD. They may also be purchased from the FEMA offices in Philadelphia or in Bethesda, Maryland. Due to such factors as a seasonal high water table and exposure to the flood hazard, floodplain soils generally pose moderate to severe limitations for development and OLDS.

Wetlands

Wetlands are generally low-lying areas with high water tables that are temporarily or intermittently filled with shallow water. The density of the soil particles in wetland soils results in low percolation rates, causing sewage to seep to the surface and producing wet, smelly, and unsanitary conditions. A high seasonal water table is generally indicative of lateral movement of water to adjacent water bodies, and any alteration of the water movement or water quality in these areas will have a direct impact on neighboring waters. Areas where the water table is at the surface are highly vulnerable to pollution. Therefore, wetlands are considered areas unsuitable for on-site systems. For more information on the location of wetlands, consult the *Soil Survey of Chester and Delaware Counties* for the presence of hydric soils or refer to the *National Wetlands Inventory* maps prepared by the U.S. Department of the Interior.

Topography

Since sewers are usually designed to make maximum use of gravity, topography is a major factor in evaluating various options for sewage conveyance and treatment. The U.S. Geologic Survey 1:24,000 topographic maps show general elevations of Delaware County, mapped as 10-foot contours. At this scale, the County appears to slope from its border with Chester County in the northwest down to the Delaware River along the southeast. The most prominent features are the major creek valleys and the ridges that divide them. These features become important in planning for the extension of existing public sewers or construction of new local sewage collection and treatment systems.

Geology

The Pennsylvania Geological Survey report entitled *Groundwater Resources of Delaware County, Pennsylvania* (1996) notes that Delaware County falls within two primary physiographic provinces. The northern two thirds, characterized by rolling terrain, lie within the Piedmont physiographic province. The other third of the County falls within the Atlantic Coastal Plain, which is the relatively flat, narrow band that parallels the

Insert Figure 4-1

Delaware River (see Figure 4-2). *The Natural Areas Inventory of Delaware County, Pennsylvania* (1992) notes that the Piedmont area consists of folded and faulted metamorphic and igneous rocks that include marble, schist, gneiss, quartzite, granite, and serpentinite. The Coastal Plain is characterized by "unconsolidated to poorly consolidated layers of Quaternary-age sand, gravel, and clay."

The groundwater resources report notes that Delaware County has "limited water resources" and that "groundwater occurs mostly in the weathered zone above bedrock and in fractures to depths of about 300 feet below land surface," with the Wissahickon formation being most productive. It states that "none of the geologic formations in Delaware County yield enough water consistently for large public or industrial supplies; however, most wells should produce sufficient quantities for domestic purposes." It also states that water quality is "generally suitable for most uses."

ON-SITE SYSTEM PROBLEM AREAS

Location of Problem Areas

Several surveyed municipalities indicated reported malfunctions in on-lot systems. Many of the malfunctions were attributed to a combination of factors including lot size, poor soils, poor maintenance, and age of systems. In some municipalities, malfunctions were limited to a few individual lots, while in others, large areas were influenced. Problem areas, as indicated by SEOs in the 2000 Delaware County survey, are depicted in Figure 4-1.

Sewage Systems Malfunctioning to Groundwater

More than half of the municipal survey respondents indicated a possibility of groundwater contamination from malfunctioning on-lot systems. Older on-lot systems built in the 1950s and 1960s and functioning as cesspools were of particular concern. Due to stricter on-lot guidelines, many of these older systems are currently being replaced by modern facilities during the resale of residential properties.

It is difficult to locate malfunctioning on-lot facilities discharging to groundwater without an extensive monitoring well system, regular sampling, or reported problems with potable water wells. In some instances existing monitoring wells do indicate groundwater contamination problems. For example, Edgmont Regal Movie Theater was required to install a holding tank for its wastewater after high levels of nitrates were detected in a nearby monitoring well. The holding tank served to reduce peak loading by discharging a lower flow for a longer period of time.

ILLEGAL SEWAGE DISPOSAL SYSTEMS

None of the municipalities surveyed indicated that they were aware of any wildcat sewers in their municipalities.

Insert Figure 4-2

CHAPTER 5

PLANNING OBJECTIVES AND NEEDS

INTRODUCTION

This update of the Delaware County Sewerage Facilities Plan follows a long history of wastewater facilities planning in Delaware County. Planning efforts have continued since each of the County's 49 municipalities adopted the *Delaware County Sewerage Facilities Plan* as their Official Act 537 Sewage Facilities Plan in 1971.

Land use, water supply, and stormwater plans with potential for impacting wastewater planning have also been prepared over the last thirty years, and municipalities have enacted zoning and subdivision/land development ordinances to carry out local planning objectives. Therefore, the purpose of this section is to identify, describe, and compare the planning that has taken place, report progress in implementation, compare various planning efforts to determine consistency or conflict, and define planning needs.

Wastewater planning documents discussed below are presented in historical context only. While many of the recommendations were implemented or are still valid, some are currently considered inapplicable due to changes in conditions unforeseen during development of those documents.

Wastewater Planning Previously Undertaken

Considerable wastewater planning has taken place since the approval in 1971 of the *Delaware County Sewerage Facilities Plan*. This planning has occurred at several levels of government including federal, regional, Countywide, and local municipal levels. Table 5-1 provides a brief history of wastewater planning affecting Delaware County.

Federal Wastewater Planning

At the federal level, EPA has provided incentives for regional and area-wide planning. The Construction Grants Program (Federal Water Pollution Control Act, P.L. 95-500, and its implementing regulations) provided funds for required area-wide facilities or "201" plans (Step 1) prior to funding wastewater facilities design (Step 2) and construction (Step 3). This program was subsequently delegated to the Pennsylvania Department of Environmental Resources (DER), now DEP. The program, with its related planning requirements, continued through amendments contained in the Clean Water Act (1977) and the Water Quality Act of 1987, although at lower funding levels than in previous years. The 1987 Act cut construction grant funding back even further, but at the same time added a new Section 601, "Grants to States for Establishment of Revolving Funds," which provides for loans to finance facility planning (and design and construction) and limited funds for area-wide planning. Today this program, as it has found its way to the state level, is known as the Pennsylvania Infrastructure Investment

TABLE 5-1

HISTORY OF WASTEWATER PLANNING IN DELAWARE COUNTY

Year	Event
1928	Delaware County Board of Engineers formed to evaluate the County's sewage facility needs.
1931	Board of Engineers' report recommends construction of six sewage systems: Darby Creek Joint, Muckinipates, Central Delaware County, Eddystone, City of Chester, and Marcus Hook. All recommendations were implemented by 1960.
1931-1967	Planning by individual municipalities leads to construction of the Radnor-Haverford-Marple (RHM), Tinicum, Media, Rose Valley, Brookhaven, and Southwest Delaware County systems.
1967	Passage of Act 537, the Pennsylvania Sewage Facilities Act. Requires all municipalities to prepare a ten-year sewage facilities plan to address their needs. Following a Pennsylvania Department of Health (PDH) recommendation, all 49 municipalities in Delaware County pass resolutions authorizing the Delaware County Planning Commission (DCPC) to prepare a County sewage facilities plan.
1971 (Jul)	Delaware County Sewerage Facilities Plan identifies needs and recommends a regionalized sewer system for as much of the County as possible.
1971 (Oct)	Delaware County Regional Water Quality Control Authority (DELCORA) is created by the Delaware County Commissioners to implement the recommended plan and is given the authority to finance, construct, and operate all interceptor systems, pumping stations, and treatment plants in the County except (1) the Upper Darby-Haverford system (which discharges directly to the City of Philadelphia network) and (2) the Bethel Township Sewer Authority system (which discharges to New Castle County). Municipal agencies retain control of local collection systems except for the Chester City, Parkside, and Upland collection systems operated by DELCORA.
1972 (Nov)	*Delaware County Regional Sewerage Project* report by Albright and Friel, division of Betz Environmental Engineers (analysis performed in 1971).
1972	Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act) Extensive regulatory and grants program for planning, design, and construction of wastewater control facilities. Section 303 of this Act established water quality standards and the calculation of total maximum daily loads (TMDLs) that a water body can receive and still meet water quality standards.
1974	In response to the Pennsylvania Clean Streams Law, the Pennsylvania Department of Environmental Resources (DER) begins to develop the Comprehensive Water Quality Management Plan for Southeastern Pennsylvania (COWAMP).
1975	Governor designates the Pennsylvania portion of the Philadelphia SMSA as a 208 study area, making the region eligible for a federal area-wide waste treatment management planning grant. With receipt of federal funds, the COWAMP and 208 programs are merged to become the COWAMP/208 Plan, with a goal of comprehensive evaluation of water quality. Existing plans already being implemented for the Regional Sewerage Project were accepted as part of the COWAMP program.
1977	Clean Water Act: 1977 Amendments to the Federal Water Pollution Control Act. Provides additional funding authorization, institutional changes, and a shift in technical emphasis to favor new waste treatment technology and control of toxic pollutants.
1978	Draft *COWAMP/208 Water Quality Management Plan* completed. Suggests alternatives for addressing sewerage needs of the upper Ridley Creek and Crum Creek watersheds and the Chester Creek watershed, but no single alternative is selected.
1979	*Supplement No. 1 to COWAMP/208 Water Quality Management Plan for Southeastern Pennsylvania.* Contains post-publication additions and corrections to the COWAMP/208 plan, including several major changes in recommendations for Delaware County.
1985	EPA issued regulations that implemented Section 303(d) of the Clean Water Act.

TABLE 5-1

HISTORY OF WASTEWATER PLANNING IN DELAWARE COUNTY (CONTINUED)

1987	Water Quality Act of 1987: amends Federal Water Pollution Control Act. For Delaware County, some of the more significant provisions include creation of (1) a program providing grants to states for establishing water pollution control revolving funds, and 2) the National Estuary Program, with Delaware Bay given priority consideration.
1988	PENNVEST. State legislation creating a revolving fund to provide loans and grants for water and wastewater facilities. Referendum approved to provide funding.
1989	National Combined Sewer Overflow (CSO) Control Strategy was published by EPA as a first step in controlling CSOs.
1990	EPA Phase I of the NPDES Stormwater Program addressed the negative impact of stormwater runoff on water quality. Municipal separate storm sewer systems that serve populations of 100,000 or more, eleven categories of industrial activities, and construction activities disturbing 5 acres or more were required to obtain NPDES permit coverage.
1992	EPA issues current TMDL regulations that included a 2-year listing cycle for states to list impaired and threatened waters, a TMDL must include point and nonpoint sources, TMDLs are subject to public review, etc.
1994	CSO Control Policy issued by EPA to provide guidance that would coordinate the planning, selection, design, and implementation of CSO management practices and controls to meet the requirements of the Clean Water Act.
1999	Phase II of the NPDES Stormwater Program was published by EPA requiring permit coverage for certain small municipal separate storm sewer systems and construction activities between 1 and 5 acres.
2000	EPA published revised regulations for the implementation of TMDLs. In 2001, began to reexamine the published rule and after consulting with stakeholders, began to redraft the rule. On March 19, 2003, EPA withdrew "Revisions to the Water Quality Planning and Management Regulation and Revisions to the National Pollutant Discharge Elimination System Program in Support of Revisions to the Water Quality Planning and Management Regulation" or what was referred to as the "July 2000" rule. It is unknown if EPA is planning to re-issue revised regulation changes.
2002	Proposed rule to reduce sanitary sewer overflows (SSOs) was published by EPA. Although it was later withdrawn, a minimally revised version is still pending. The proposed rule includes clarification of the Clean Water Act's prohibition of overflows, provisions to expand permit coverage to satellite systems (collection systems that discharge to another entity for wastewater treatment), and requirements for a collection system management program (CMOM – Capacity, Management, Operation, and Maintenance).

Source: DCPD, 2002; Weston Solutions, Inc., 2003

Authority (PENNVEST). Table 5-2 lists recent PENNVEST loans and grants in western Delaware County.

In 1974, DER began work on a Comprehensive Water Quality Management Plan for Southeast Pennsylvania (COWAMP) under Pennsylvania's Clean Streams Law. This work and federally initiated planning under Section 208 of the Water Pollution Control Act were merged, and the combined COWAMP/208 Plan was published in draft form in 1978 and supplemented in 1979. The plan was intended to serve as a guide to wastewater planning in southeastern Pennsylvania. While the plan was unable to reach consensus on recommended actions for specific geographic areas in Delaware County, other than to recommend additional "201" facilities planning studies, it did provide policy guidance. Although the plan recognized that public sewers would continue to be a viable solution for wastewater problems in many areas, its emphasis was also towards alternative "non-sewer" methods of wastewater disposal. Land application and the maintenance and management of OLDS were stressed as considerations for future planning.

Section 303 of P. L. 92-500 provided for planning for an even larger area, and the *Delaware River Basin Comprehensive Study* was partially funded by that program. With the 1987 amendments to the Act, the Delaware Estuary was given special attention, and planning efforts have begun to identify the full spectrum of needs related to this major water resource.

State/County Wastewater Planning

Act 537, the Pennsylvania Sewage Facilities Act, requires municipalities to prepare 10-year plans to address their sewage facilities needs. As recommended by PDH, all 49 municipalities in Delaware County passed resolutions authorizing DCPC to prepare a County sewage facilities plan on their behalf. The resulting 1971 *Delaware County Sewerage Facilities Plan* identified needs and recommended a regionalized sewer system for as much of the County as possible. Table 5-3 lists the plan's major recommendations and their current status. Each of the 49 municipalities adopted this plan (by resolution) as their Official Sewage Facilities Plan.

Delaware County Regional Sewerage Project

As a follow-up to the 1971 *Delaware County Sewerage Facilities Plan*, detailed engineering studies were undertaken for the County by Albright and Friel, a division of Betz Environmental Engineers, resulting in the 1972 report of the *Delaware County Regional Sewerage Project*. The report divides the County into two service areas: the predominantly sewered area east of Crum Creek and the western area that includes the Chester and Ridley Creek watersheds and the upper Crum Creek watershed above Geist (Springton) Reservoir. While the lower portions of the watersheds were largely sewered and included major wastewater producing industries, the upper portions were largely unsewered, with high growth potential.

TABLE 5-2

PENNVEST LOANS TO SEWER AUTHORITIES SERVICING WESTERN DELAWARE COUNTY (1996-2002)

Project Name	Project Type	Date of Approval	Amount	Project Description
Concord Township Sewer Authority	Municipal Authority-Sewer	3/24/99	$600,000	Public sewer extension to an area of 85 existing homes and four businesses
Delaware County Regional Water Quality Control Authority	Municipal Authority-Sewer	11/17/99	$5,009,000	Design and construction of an upgraded pump station and 3 miles of force main to divert existing flows from CDCA service area to DELCORA's WRTP
Southern Delaware County Authority	Municipal Authority-Sewer	7/18/01	$4,888,000	Construction of a new pump station and 2.5 miles of force main to convey flows from New Castle to DELCORA
Southwest Delaware County Municipal Authority	Municipal Authority-Sewer	7/15/98	$567,289	Rehabilitation and replacement of 1.6 miles of collection lines to eliminate raw sewage discharges into local streams
Southern Delaware County Authority	Municipal Authority-Sewer	7/15/98	$681,266	Rehabilitation and replacement of approximately 2 miles of collection lines and manholes to eliminate raw sewage discharges into Naamans Creek (West Branch and Main Branch Naamans Creek Interceptor lines)
Southern Delaware County Authority	Municipal Authority-Sewer	7/15/98	$642,800	Various sewer extensions into unsewered areas
Southern Delaware County Authority	Municipal Authority-Sewer	3/20/96	$510,535	Installation of approximately 1 mile of new collection lines to replace malfunctioning OLDS
Southwest Delaware County Municipal Authority	Municipal Authority-Sewer	3/24/99	$758,733	Rehabilitation and replacement of approximately 8,500 feet of sanitary sewer lines subject to I&I in various locations
Upper Chichester Township	Municipal-Storm-water	3/22/00	$559,000	Improvements and extension of stormwater collection system at various locations throughout the Township
Upper Chichester Township	Municipal-Storm-water	3/25/98	$900,000	Improvements and extension of stormwater collection system at various locations throughout the Township

Source: PENNVEST website, 2003

TABLE 5-3

1971 DELAWARE COUNTY SEWERAGE FACILITIES PLAN (ACT 537)

	Item	Recommendation	Status
1	Acceptance of the Plan	All municipalities in Delaware County should enact formal resolutions adopting this plan in accordance with the Pennsylvania Sewage Facilities Act.	Done
2	Municipal Sewerage Plans	Each of the municipalities should prepare a sewerage plan, including proposed expansion and/or modifications to sewage collections facilities. These municipal plans should be in agreement with this Sewerage Facilities Plan.	See review of Municipal Wastewater Planning for individual municipalities.
3	On-Site Disposal Systems	In order to alleviate or forestall any health problems caused by malfunctioning individual on-site disposal systems, all municipalities should adopt ordinances governing these systems, especially in areas having hazardous soil conditions. The ordinances should also cover the design, construction, and operation of on-site systems, as set forth in Act 537.	DEP currently has standards and model ordinances available for use.
4	Modifications to Sewerage Facilities Plan	The *Delaware County Sewerage Facilities Plan* should be routinely updated and/or modified as necessary, as development patterns warrant. In addition, the plan should be re-evaluated every 5 years or more frequently if needed.	In municipalities with unsewered areas, an SEO routinely reviews planning modules for proposed land development for consistency with the local Act 537 plan, and DCPD has an opportunity to comment before requests for plan revisions are approved by DEP. Most of the western study area municipalities have recently updated their own Act 537 plans. Upon completion of this document, western municipalities can choose whether to adopt the new plan. Eastern study area municipalities adopted the new Delaware County Act 537 Plan in 2002.
5	Regional Sewerage Project	Complete the *Delaware County Regional Sewerage Project.*	The study was completed in 1972. Most, but not all, of the study's recommendations have been implemented.
6	Radnor-Haverford-Marple Authority	Treatment facility to be phased out. Plant to operate until adequate treatment is available downstream.	Done. RHM now operates an interceptor which flows into the DCJA pump station for conveyance via DELCORA's interceptor to PSWPCP.
7	Upper Darby-Haverford (Philadelphia S.W.).	Continue to discharge to the Philadelphia system.	Flows still go to Philadelphia.

TABLE 5-3

1971 DELAWARE COUNTY SEWERAGE FACILITIES PLAN (ACT 537)

(CONTINUED)

8	Darby Creek Joint Authority	Continue present operation. Further analysis and evaluation during the Delaware County Regional Sewerage Project should determine the best mixture between expansion and/or bypass of flows to the Philadelphia Southwest treatment facility.	Following an interim solution of bypassing some flow to the Philadelphia Southwest plant, DCJA ceased treatment operations. DCJA has operated as a collection authority only since the 1976 expansion of the Philadelphia plant. In 1980, DELCORA constructed the Darby Creek Pump Station to pump flows to PSWPCP.
9	Muckinipates Authority	Upgrade treatment to achieve DRBC allocation and continue to operate.	This was not done. The plant was phased out and the Authority operates for the purpose of conveyance only. In 1980, DELCORA constructed the Muckinipates Pump Station to pump flows to PSWPCP.
10	Tinicum Township	Upgrade treatment to achieve DRBC allocation and continue to operate.	The plant is still operating.
11	Central Delaware County Authority	Continue present operation. The Regional Sewerage Project will determine whether plant expansion or diversion of the area's flow to a possible regional treatment plant is the best alternative.	The Central Delaware County treatment plant was phased out in 1980 and replaced by a DELCORA pump station/force main to PSWPCP. Construction is now near completion on a project to divert up to 12 MGD to DELCORA's WRTP.
12	Eddystone Borough Treatment Plant	Phase out and construct connection to City of Chester sewer system.	Done.
13	Media Borough Treatment Plant	Continue to operate as is. (Shown on map to be phased out by 1990.)	Still operating. Plant has been upgraded to permit increased flows.
14	Brookhaven Borough Treatment Plant	Phase out and construct connection to the Southwest Delaware County sewer system.	Still operating. Recently underwent upgrade.
15	Rose Valley Treatment Plant	Continue to operate until an interceptor is built along Ridley Creek (1975), then phase out plant.	During facility planning for the Ridley Creek Interceptor, Rose Valley indicated that it preferred to continue to operate its plant. It is still operating.
16	Southwest Delaware County Municipal Authority	Expand the Baldwin Run Pollution Control Facility to 4 MGD and upgrade treatment efficiency to meet proposed DEP effluent standards.	Plant has been expanded to treat flows up to 6 MGD.
17	Chester City Treatment Plant	Upgrade and expand to serve as regional treatment plant for Chester and Ridley Creek watersheds.	This is now the DELCORA WRTP. It has been expanded to 44 MGD and upgraded to secondary treatment.

TABLE 5-3

1971 DELAWARE COUNTY SEWERAGE FACILITIES PLAN (ACT 537)

(CONTINUED)

18	Marcus Hook Borough	Phase out Borough Treatment Plant and construct connection to City of Chester sewer system.	Done.
19	Chadds Ford Area	Construct interim sewage treatment plant. Phase out plant when interceptor is extended up the Brandywine Creek watershed (1985).	Studies (1973 and 1976) proposed a 0.25 to 0.30 MGD plant in Chadds Ford, with an interceptor up Harvey Run to serve the Route 1 – Painters Crossroads area, but funds were not available. Instead, a number of small treatment plants have accompanied development in the Painters Crossroads and Chadds Ford areas. CFTSA owns and operates the Ridings WWTP, which was constructed in 1994 and is permitted for flows up to 0.08 MGD.
20	Southern Delaware County Authority	Continue to discharge to New Castle County sewage system. Expand service area to include Bethel Township. Modify agreement with New Castle County to allow increased discharge up to 4.0 MGD.	Service area has been expanded in Bethel Township. Approximately 1.5 MGD of sewage formerly conveyed to the New Castle County Authority's system to be treated at the City of Wilmington Water Pollution Control Plant was diverted to the DELCORA Treatment Plant on March 20, 2002 (Naamans Creek Bypass). A new amendment to SDCA's 537 Plan was submitted to DEP in April 2002 and was approved in October 2002. The amendment diverted its Marcus Hook watershed 0.8 MGD flows from SWDCMA's Baldwin Run Pollution Control Facility to DELCORA's WRTP. Only about 613 EDUs from SDCA's collection system are treated at the SWDCMA plant. BTSA collects and conveys most of the flows through SDCA, with a small portion of the wastewater directed to New Castle County, Delaware.

Source: DCPD, 2002; Weston Solutions, Inc., 2003

The plan recommended conveying wastewater from RHM, DCJA, Muckinipates, Tinicum, and Central Delaware County Authorities to an expanded and upgraded PSWPCP for treatment. For the remaining portions of the County, it recommended conveying all wastewater to an upgraded and expanded plant at the existing Chester City plant site for treatment and gradually phasing out all other treatment facilities, including nineteen institutional plants. Implementation was to occur by 2020, in four stages. It recommended creation of a County-level sewer authority in Phase I to implement the recommended plan and assume responsibility for its continued operation. The resulting County-level authority was DELCORA. Following approval by the Delaware County Commissioners at a public hearing, DER accepted this report as a guide to the design of wastewater facilities in the study area. There is no record that individual municipalities adopted it as a revision to their Official Sewage Facilities Plan under Act 537.

Since that time, most of the municipalities located in the western portions of the County have prepared, adopted, and received DER/DEP approval for complete updates or major revisions to their Act 537 Plans. Until recently municipalities in the eastern portion of the County continued to rely on sewage facilities plans prepared in the 1970s. The new *Delaware County Act 537 Sewage Facilities Plan, Eastern Plan of Study* was fully adopted by the eastern municipalities in 2002 and received final approval in 2003.

Municipal Wastewater Planning

Since the preparation of the 1971 *Delaware County Sewerage Facilities Plan*, numerous sewerage feasibility studies and facilities plans have been prepared. The recommendations of these studies and plans and the responses of various local regional, state, and even federal agencies to those recommendations have shaped the specific components of the County's sewage facilities network over the past thirty years.

The following section summarizes local planning efforts in the western study area municipalities in the context of County and regional plans and in accordance with state and federal regulatory requirements.

WASTEWATER PLANNING IN THE WESTERN STUDY AREA

Details of Individual Municipal Wastewater Planning Documents in the West

The following is a brief description of previous and current planning documents created by municipalities in the western planning area. The *Delaware County Sewerage Facilities Plan*, prepared in 1971 by the County Planning Commission on behalf of all 49 municipalities to satisfy sewage facilities planning requirements under Act 537, contained the recommendations in Table 5-3.

Aston Township

Aston Township is almost entirely served by sewers owned by SWDCMA. The Township's Act 537 Plan (along with Upper Chichester Township and Chester Heights

Borough) was prepared by SWDCMA and approved by DEP in 1997. The plan addresses a new conveyance system in northwestern Aston Township. Intermunicipal cooperation among Aston, Chester Heights, and Upper Chichester and implementation of "sub-regional" public sewage facilities planning are also discussed. The most recent Act 537 survey is dated August 2000 and lists no future planning considerations. A corrective action plan was prepared in 2002 to alleviate overloading problems of the Baldwin Run Pollution Control Plant. The plan calls for general maintenance, a grouting program, and plant upgrades to help maintain the plant's flows within the permitted capacity of 6 MGD.

Bethel Township

Bethel Township initially adopted the 1972 *Delaware County Regional Sewerage Project.* The plan was amended in 1974 with a sewage feasibility study, which concluded that installation of sewers Township-wide was cost prohibitive. The plan was revised in 1987 proposing installation of public sewers in part of the Township. In 1995, the new plan was revised and adopted in conjunction with the BTSA Central District Project.

The Bethel Township Act 537 Plan was updated in 1998 along with the plan for Upper Chichester Township by SDCA. The plan provided for 1.5 MGD of wastewater flow treated at the Wilmington (New Castle County, Delaware) facility at the time to be diverted to the DELCORA WRTP. Flow diversion was to be achieved by the construction and operation of a 1.5 MGD pump station and 2.5 miles of force main to convey flows from the Naamans Creek Interceptor to DELCORA's system in Marcus Hook Borough.

The 1999 Bethel Plan Update found that sewage capacity was insufficient in portions of the Township due to increasing population growth. At the same time, limited capacity was available at the SWDCMA Baldwin Run Pollution Control Facility. Therefore, the alternative of choice was to convey a portion of the Township's flows to New Castle County, Delaware, with remaining flows being directed to the SDCA system. Also, according to the 2002 update to SDCA's Act 537 Plan, forty present EDUs and 125 future EDUs (from growth projections) will be by-passed from SWDCMA to DELCORA.

Brookhaven Borough

Several formal Act 537 Plans were adopted in Brookhaven Borough in the past thirty years, including one prepared in 1989 and submitted in 1990 as an appendix to the SWDCMA plan. The latest update to the Brookhaven Borough Act 537 Plan was approved by DEP in 1998. This update evaluated upgrading the Brookhaven WWTP as well as the possibility of treatment of additional flows by SWDCMA as possible alternatives for the improvement of wastewater management. Upgrade of the Brookhaven WWTP was selected as the most viable solution that is beneficial to Borough residents and the environment.

Chadds Ford Township

Chadds Ford Township (formerly Birmingham Township) prepared an Official Act 537 Plan Update in 1991. The plan addressed the increasing need for wastewater treatment due to intensified growth, particularly in the Route 1 corridor. The plan opposed centralized sewerage, which could enhance development in this rural community, subject Chadds Ford Township to large debt, and jeopardize its rural character. The plan also expressed concerns regarding the environmental impact of large quantities of wastewater disposal within the Brandywine Creek basin. The plan update acknowledged the existence of areas with malfunctioning OLDS.

The plan suggested continued use of on-lot disposal methods and exploration and implementation, where feasible, of land application methods. The plan also suggested that a planned treatment facility for a new development be built with excess capacity to accommodate additional flows from those areas experiencing wastewater disposal problems. In conjunction with the plan's recommendation, the Ridings WWTP was built in 1994. The only amendment to the 1991 Act 537 Plan was made recently to allow for a holding tank in place of a failed OLDS at a Route 1 and Heyburn Road shopping center.

Chester Heights Borough

The first Chester Heights Borough Act 537 Plan was, in fact, the 1972 *Delaware County Regional Sewerage Project*, adopted in 1976. This plan called for most of the Borough to be sewered following trunk lines along Chester Creek and the West Branch of Chester Creek. A majority of the recommendations of this plan were not implemented. The latest Act 537 Plan Update was prepared for Chester Heights Borough (along with Upper Chichester and Aston) by SWDCMA and approved by DEP in 1997. The plan recommended the extension of the SWDCMA service area to accommodate additional Chester Heights sanitary flow. The plan noted that Chester Heights Borough needs to play a larger role in sewerage facilities oversight (failure of individual disposal systems, for example), which could be partially achieved through participation in SWDCMA's "subregional" extensions of the public sewerage network.

Concord Township

Concord Township is undergoing a surge in development and is adjusting its wastewater planning in accordance with development plans. Long-term goals of the 1988 Concord Township 537 Plan were planning for a sewage plant in the lower reaches of the Township and/or possible connection to the DELCORA system. The 1992 update discussed construction of a 1.2 MGD WWTP. The CTSA WWTP was constructed in 1996 and is currently permitted for a 1.2 MGD flow. Several special studies addressed specific needs in developing areas of the Township, such as the 1999 studies of the Northwest area and the Smithbridge Road area. The Northwest study proposed the construction of the East and West Branch of the central trunk line to allow service to be extended into troubled areas. The Smithbridge Road area study suggested construction of

the gravity sanitary sewer extension along Smithbridge Road. Both extensions were implemented shortly thereafter.

The latest Concord Township Act 537 Update is currently being reviewed by DEP. The selected alternative suggests continued connections to the existing treatment plant. The Township intends to expand the existing plant from 1.2 to 1.8 MGD to provide "more than sufficient capacity for all projected public sewer connections for the next 10 years." The plan also provides for accepting flows from Thornbury Township, in conjunction with Thornbury's recent Act 537 Plan Update. The update also suggests continued connections to the Riviera STP for properties located in the Green Creek watershed.

Edgmont Township

Edgmont Township adopted the *Delaware County Sewerage Facilities Plan* of 1971. The Township found it was not feasible to provide sewage collection systems and instead resolved to adopt the County plan with provisions for individual on-lot disposal. In 1999, a portion of Edgmont Township (approximately 850 acres – 13.6% of the Township) was included in the Sanitary Sewage Flow Study within the Crum Creek watershed. The goal of the study was to determine the feasibility of extending the existing Crum Creek Interceptor service area to the Chester County border. The Township recently produced an Act 537 Plan. The plan reiterates the Township's determination to continue using on-lot systems for wastewater management. Several community facilities will be eliminated while wastewater will be directed to Newtown Township for treatment and subsurface release.

Media Borough

Media Borough adopted the *Delaware County Sewerage Facilities Plan* of 1971 for its wastewater planning. In 2000, the Borough prepared its own Act 537 Plan, which called for continuing operation of the Media STP, efforts on I&I reduction, and improvements to pumping and conveyance facilities. Most importantly, cost estimates showed the feasibility of the sale of the STP to a private utility company, which was accomplished in 2001. Philadelphia Suburban's Little Washington Wastewater Company (now Aqua Pennsylvania, Inc.) purchased the Media Borough Treatment Plant and collection system. The Borough entered into an oversight agreement with the new owner, which allows access for examination of operations and effectiveness of the system on an on-going basis.

Middletown Township

DCPD records show that the Middletown Township Act 537 Plan was last updated in 1998. In May 2000, Middletown Township Council authorized MTSA to update the Township's Act 537 Plan with special attention to the future demands on the interceptor sewers. The draft plan addresses growing sewer needs due to increasing population, I&I issues, and the unsuitability of many areas for OLDS. The plan also

questions the compatibility of the SWDCMA treatment facility with population forecasts in the area. Proposed alternatives include public sewer service where financially feasible and environmentally necessary, while continuing use of OLDS for single dwellings in remote low-density locations. The plan also addresses measures for I&I reduction.

Newtown Township

Newtown Township's Act 537 Plan was adopted in 2002 and approved by DEP on August 29, 2002. The current update recommends return to regional sewerage by conveying wastewater to CDCA through the Crum Creek Interceptor. This will reduce the Township's flow to the RHM and Media systems.

Rose Valley Borough

Rose Valley Borough adopted the *Delaware County Sewerage Facilities Plan* of 1971, which called for phasing out of the Borough STP. There has been very little development or redevelopment in the Borough, and officials have since concluded that there was no need to develop additional sewage planning documents. The Rose Valley STP continues to operate.

Thornbury Township

Thornbury Township adopted its latest revision to the Act 537 Plan in August 2001. The plan analyzes separately the eastern (eastern portion of Chester Creek watershed) and western (West Branch Chester Creek watershed) portions of the Township. The plan proposes construction of several pump stations, force mains, and gravity sewers to convey wastewater from subdivisions to the Thornbury Treatment Plant (eastern portion of the Township) and the Concord Township Treatment Plant (western portion of the Township).

Upper Chichester Township

Several current plans address sewer issues in Upper Chichester. The 1997 plan prepared by SWDCMA discusses additional flow and I&I issues and recommends extension of the SWDCMA Woodbrook PS service area in Upper Chichester Township. The plan also addresses intermunicipal cooperation in the area and recommends that it be continued and strengthened.

Two Upper Chichester Act 537 Plan Updates were prepared in 1998 due to the impending contract expiration with New Castle County and the City of Wilmington for conveyance and treatment of flows on December 24, 1998. Both were developed by SDCA on behalf of the Township to avoid the New Castle County sewer ban on new SDCA connections and allow for future growth. The first plan addresses the Marcus Hook Creek watershed and suggests bypassing SDCA sewerage services from New Castle County, Delaware, to SWDCMA. The second update concentrates on the Naamans Creek watershed area and proposes extension of the DELCORA service area to

accommodate approximately 1.5 MGD of additional SDCA flows from the Naamans Creek watershed.

SDCA was faced with service expansion constraints in 2001 due to DEP imposed new connection limitations at SWDCMA's Baldwin Run Pollution Control Facility. Once again, SDCA was forced to reevaluate its sewage planning on behalf of Upper Chichester Township in 2002. In October 2002, an Act 537 Plan Update that recommended bypassing additional SDCA flows from SWDCMA to DELCORA by means of existing infrastructure that allows for opposite direction flows was implemented. About 2,690 present EDUs and 200 future EDUs (projecting growth) are considered from Upper Chichester Township.

Upper Providence Township

Upper Providence Township's Act 537 Plan was adopted in 1999 and addresses issues related to the Media WWTP located in Upper Providence. The Township is currently in the process of updating the plan together with Newtown Township. The update is expected to recommend return to the regional sewerage by conveying wastewater to CDCA through the Crum Creek Interceptor. This will reduce the flows to the RHM and Media systems and provide additional capacity for anticipated growth.

Other Related Planning

Government and public organizations in the planning area prepared numerous reports that directly or collaterally address wastewater issues in the last several decades. Some reports were prepared pursuant to state regulations while others were dedicated to specific projects.

Stormwater management planning under Pennsylvania Act 167 has either been completed or is underway in many of Delaware County's watersheds. An Act 167 stormwater management plan (SWMP) for the Ridley Creek watershed was prepared in 1988, and a plan for the Chester Creek watershed was recently completed in 2003. Act 167 SWMPs for Darby-Cobbs and Crum Creeks are currently underway, and are expected to be completed by summer 2006 and summer 2007, respectively. All of the SWMPs with the exception of Ridley Creek, which was prepared before stormwater quality requirements took effect, require municipal adoption of a model ordinance that includes criteria for determining pre- and post-development runoff rates, performance standards for managing stormwater runoff, criteria for stormwater management system design, water quality control criteria, and groundwater recharge requirements.

Several studies were completed by private consultants on behalf of DELCORA. The first was prepared in 1999 and addressed sanitary sewage flows for portions of Edgmont, Newtown, and Upper Providence Townships within the Crum Creek watershed. The study estimated future wastewater flows to evaluate the feasibility of extending the existing Crum Creek Interceptor service area to the Chester County border.

A second study (1999) analyzed the "Western Region" (area of interest of this plan with the exception of Newtown, Upper Providence, and Media) growth and flow projections.

In February 2000, DELCORA completed a study of the forward liquid flow processes at WRTP. The resulting report, entitled *Western Regional Treatment Plant Process Improvement Project*, indicated that four different unit process parameters limit the ability of the WRTP to increase its permitted capacity to 50 MGD. The limitations are based upon DEP design guidelines for WWTPs found in the *Domestic Wastewater Facilities Manual* (DEP 362-0330-001).

The process limitations are:

1. The minimum hydraulic detention time (HDT) in the aeration tanks at average daily flow.
2. The maximum weir overflow rate in the primary clarifiers.
3. The maximum standard actual oxygen requirement (SAOR) in the secondary clarifiers.
4. The minimum ratio of oxygen supply (pounds of O_2) per pound of BOD_5 in the aeration tanks is 1.1 lbs. of O_2 per lb. of BOD_5 at peak flow according to the DEP design guideline. DELCORA is currently preparing the design of an aeration system upgrade at WRTP that will meet this DEP guideline while providing power savings at WRTP.

DELCORA recently completed Phase 1 of the WRTP re-rate process with the evaluation of solids processing at WRTP, development of an approach for addressing each unit process limitation, and meeting with DEP to present the approaches developed. DELCORA used the projected flows developed for the 50 MGD future loading at the WRTP to estimate the solids loading anticipated at 50 MGD. These loadings were compared to the solids handling treatment process capacities and the DEP guidelines. DELCORA found that the projected solids loadings would not exceed the current solids handling treatment process capacities.

DELCORA is executing work to support deviation from DEP guidelines for weir overflow rate in the primary settling tanks, hydraulic retention time in the aeration tanks, and surface overflow rate in the secondary clarifiers under the proposed re-rate condition (50 MGD average daily flow).

LAND USE PLANNING AND REGULATION

To ensure proper development and alleviate growth pressures, municipalities are "enabled" to adopt planning documents pursuant to the MPC, Act 247 of 1968, as amended. These planning documents include comprehensive land use plans, zoning ordinances, and subdivision/land development regulations.

One of the main reasons for examining these documents while preparing the sewage facilities plan is to establish the interrelationships between the need for sewers

and the existing and proposed land uses within each municipality. Conversely, one might expect that many of the proposed land uses within a municipality would be predicated upon the availability of sewage collection and treatment facilities. While this was once the case in remote areas, it now appears that a lack of existing public infrastructure can be overcome through both innovative technology as well as private funding for new sewage facilities.

As previously discussed, Act 537 requires municipalities to adopt sewage facilities plans for the provision of adequate sewage facilities as well as to protect water supplies. These plans should allow for a variety of treatment techniques based upon their availability, efficiency, and cost. Therefore, the task in this section is to analyze the correlation between documents adopted under Act 247 and Act 537.

Comprehensive Planning

County Planning

Act 247 requires all counties to prepare and adopt a comprehensive plan within three years of the effective date of the Act and that adopted municipal comprehensive plans be generally consistent with an adopted county plan. The existing unofficial County comprehensive plan, *Delaware County Land Use Plan 2000* (issued January 1976), was largely a compilation of municipal comprehensive plans and is, therefore, consistent with those plans. Only the policies section of the *Open Space, Parks, and Recreation Study* (1978), which was developed pursuant to the plan, was ever officially adopted by the County. DCPD is currently in the process of preparing a County comprehensive plan that will meet state requirements and provide the necessary guidance to both County agencies and municipalities regarding future growth, development, and redevelopment in the County. The plan will restate the objectives of maintaining the existing public sewer network and providing capacity for extension to areas in need of connection. The need for viable wastewater treatment alternatives in the developing parts of the County will be emphasized. The plan will take into account that these goals should be approached while encouraging sustainable development practices and preserving and enhancing the environment.

Municipal Planning

All of the western Delaware County municipalities have an adopted comprehensive plan. The land uses and densities recommended in these plans were based, to a great extent, on soil suitability for OLDS and the availability of public sewers. Plans prepared in the early 1970s tend to be consistent with the County's 1971 Act 537 Plan, while some of the later plans either advocate additional sewerage studies or refer to studies already in progress.

Municipal Zoning

In developing areas, municipal zoning has a great impact on density, ultimate build-out, and need for sewers to serve development that occurs in accordance with the zoning. Needed facilities to serve the various types of development depend on a number of factors, only one of which is zoning.

In developed areas of western Delaware County, such as Media Borough, Rose Valley Borough, Brookhaven Borough, and Upper Chichester Township, zoning is not a driving force in sewage facilities decision-making since most of these areas are already publicly sewered. Therefore, any infill, redevelopment, or even new development in these municipalities is within a relatively short distance of a public sewer system and is expected to connect to the nearest system.

The majority of western Delaware County, however, is undergoing or has the potential for additional residential, commercial, and industrial development. This particularly applies to municipalities located in the northern and western part of western Delaware County. In these municipalities, zoning regulations have a significant effect on development patterns, thus influencing the development of sewage systems. Many zoning ordinances include restrictions on lot sizes based on availability of public utilities.

Planning Documents in the Western Study Area

As noted previously, with the exception of a few areas adjacent to the more urbanized eastern part of Delaware County, nearly all of western Delaware County still has development potential. DCPD records indicate that all of the municipalities in the western portion of the County have comprehensive plans; however, some of them date back to the early 1970s. These plans address issues of land planning; residential, commercial, industrial, and institutional development; transportation; community facilities and service; utilities; and environmental and economic resources. Most municipalities have zoning and land development ordinances, many of which were developed or revised in the 1990s. Lot sizes in western Delaware County vary from fairly small ones in developed areas to multi-acre lots in some areas of the developing western and northern municipalities. Table 5-4 summarizes these regulations in the western study area.

Details of Individual Municipal Planning Documents in the West

The following is a brief description of the zoning/build-out potential as well as the sewage facility-related zoning provisions of the municipalities noted previously.

Aston Township

Aston Township's zoning ordinance allows for a number of land uses including residential, commercial, planned business campus, shopping center, limited industrial,

TABLE 5-4

LAND USE DOCUMENTS FOR WESTERN DELAWARE COUNTY MUNICIPALITIES

Municipality	Date (Status)	Summary	Min lot size dependent on sewerage?	Inconsistencies
Aston Township	Ordinance – October 17, 1990 as amended through 1997 Map – May 19, 1997 Comprehensive Plan – June 1987 Act 537 Survey Plan Map – August 2000	All homes served by public sewer with exception of approx. 50 that are scattered throughout the Township. Planning and zoning code requires installation of capped sewers where plans for public sewers are approved and a permit has been secured to provide connection within a 5-year period. Mobile home parks are required to be served by public sewer.	R1 minimum = 20,000 sq.ft. Increases to 30,000 if no public sewer and water. R2 minimum = 10,000 sq.ft., 30,000 if no public sewer and water, 15,000 if no public sewer or water.	June 1987 comprehensive plan contains outdated statements about increasing minimum lot sizes from 20,000 sq. ft. to 1 acre. The minimum lot size has been increased to 30,000 sq.ft. in the planning and zoning code. June 1987 comprehensive plan contains outdated statements about development in the northwestern and north central portions of the Township projected to be low intensity and served by OLDS. The August 2000 Act 537 Survey Plan shows that the only unsewered roads are sections of Pennell Road and Mount Road in the northeastern portion of the Township.
Bethel Township	Subdivision and Land Development Regulations – 1977 1972 Planning Study Zoning Ordinance – June 12, 2001	S&LD regulations contain requirement for installation of capped sewers in all cases where sanitary sewers are not yet available. Requires connection to sewers when they are available. Zoning ordinance says that the Township Engineer must approve all methods of sewage disposal. Mobile home parks, PRDs, C-1, and R-4 are required to be served by public sewer.	In R-1 and C-1, minimum lot size of 40,000 sq.ft. is reduced to 30,000 sq.ft. with public sewer and water.	

TABLE 5-4

LAND USE DOCUMENTS FOR WESTERN DELAWARE COUNTY MUNICIPALITIES (CONTINUED)

Brookhaven Borough	Comprehensive Plan – 1991 Planning and Zoning Code as amended through 2001.	Comprehensive plan calls for revision of the zoning ordinance to increase the minimum lot size of 3,500 sq.ft.	No – All of Borough is served by public sewer.	Comprehensive plan recommends closing the Brookhaven STP (Brookhaven and Bridgewater Roads). This has not yet occurred.
Chadds Ford Township	Zoning Ordinance amendments through 2001. Comprehensive Plan – May 1973.	States that mobile home parks must comply with the Act 537 Plan of 1966 as amended. Requires new development to tie into public sewer systems where they are available. All districts require sewage disposal in accordance with requirements specified by state, county, and township officials. Ord.84A (2001) requires improved properties to connect to public sewers within 60 days of written notice to do so.		.
Chester Heights Borough	Subdivision and Land Development Ordinance, 1997. Zoning Ordinance – July 5, 1983 as amended through Oct. 14, 1997 Comprehensive Plan - 1971	PRDs must be served by community or public sewers. Mobile home parks are required to be consistent with Act 537 Plan and to connect to public sewer "if available." PRDs must have approval of Borough Engineer for sewage treatment system.	No	

TABLE 5-4

LAND USE DOCUMENTS FOR WESTERN DELAWARE COUNTY MUNICIPALITIES (CONTINUED)

Concord Township	Zoning Ordinance - September 2001 Comprehensive Plan Update – June 6, 2000 Complete Township Code – December 25, 2001	Specifies that industrial pre-treatment facilities be permitted. All stream discharges must comply with the Clean Streams Law. Requires planned active adult communities and PRDs to connect to public sewer. States that PRDs must be consistent with the comprehensive plan. Mobile home parks are required to be consistent with Act 537 Plan and to connect to public sewer "if available." Chapter 136 of Township Code contains detailed specifications for sewers. Requires DEP approval of community treatment system, improved properties to connect to public sewer within sixty days of notice, and installation of capped sewers where public sewers are planned.	No	Comp plan recommends future examination of the feasibility of providing public sewer service to existing neighborhoods that are currently unsewered.
Edgmont Township	Comprehensive Plan – September 20, 2000 Zoning Ordinance – December 17, 1997 Subdivision and Land Development Ordinance – December 17, 1997	S&LD regulations contain requirement for installation of capped sewers in all cases where sanitary sewers are not yet available. Requires connection to sewers when they are available. Zoning requires PRDs to be served by public sewer.	No	The comprehensive plan recommends the continued use of the existing community STPs. Recommends evaluation of providing community STPs to areas of future development as part of the Act 537 Plan Update.
Media Borough	Zoning Ordinance – September 21, 2000 General Code Ch. 237 – Sewerage Ordinance 135 – March 2, 1926 Comprehensive Plan - 1986	Sewerage ordinance requires connection to public sewer. S&LD ordinance requires installation of sanitary sewers and laterals before planned roads are built.	No	

TABLE 5-4

LAND USE DOCUMENTS FOR WESTERN DELAWARE COUNTY MUNICIPALITIES (CONTINUED)

Middletown Township	Zoning Ordinance – December 1990 Subdivision and Land Development Ordinance – November 20, 1996 Comprehensive Plan – March 26, 2001	Developments required to connect to public sewers if available. OLDS must have DEP approval. PRDs must be served by public sewer. Comp plan says 98% of dwellings serviced by public sewer. Comp plan has zoning strategies to guide development to areas of existing infrastructure.	R-2, R-3, R-4 minimum lot size is 1 acre if not served by public sewer, 0.25 acre if served by both public sewer and water, and 0.5 acre if served by public water or sewer.	
Newtown Township	Subdivision and Land Development Ordinance – 1995, as amended September 25, 2000 Comprehensive Plan – October 25, 2001 Zoning Ordinance – as amended September 9, 2003	SL&D ordinance requires new development to connect to public sewer if accessible. OLDS have to conform to state requirements. Capped sewer systems to the right-of-way line are required if trunk line extension is anticipated within ten years. Zoning ordinance requires R-4 townhouse developments and conditional uses under special use districts to be served by public sewer and water.	No	Comprehensive plan recommends oversight of the increasing trend toward package plants and that the Act 537 Plan Update include evaluation of OLDS failures due to age.
Rose Valley Borough	Subdivision and Land Development Ordinance – November 1964 Comprehensive Plan – November 1971 Zoning Ordinance – February 22, 1983	No mention of sewage in zoning ordinance. Comprehensive plan talks about small numbers of homes not able to be served by Rose Valley STP. At the time of the study, they were on OLDS.	No	

TABLE 5-4

LAND USE DOCUMENTS FOR WESTERN DELAWARE COUNTY MUNICIPALITIES (CONTINUED)

Thornbury Township	Code of Ordinances Revised through April 5, 2000 Subdivision and Land Development Ordinance – April 5, 2000 Comprehensive Plan – May 1993 Zoning Ordinance – April 5, 2000	Requires connection of existing structures to sewer extensions as they are installed. SL&D ordinance required new developments to connect to public sewer if accessible. Zoning requires public or community systems for apartments. Comp plan says 1972 Health Department Study concluded that 10% of OLDS in study area had problems. Recommends continuation of use of on-lot package plants. Recommendation that planned developments be required to provide public or community sewers is consistent with zoning.	Commercial district minimum lot size of 12,000 sq.ft. increases to 30,000 if not served by public sewer.	
Upper Chichester Township	Comprehensive Plan – December 1990 Subdivision and Land Development Ordinance – 1994 Zoning Ordinance – 1991	PRDs must be served by public sewer. SL&D ordinance requires community systems if public sewers are not available and OLDS are not feasible.	R-1 minimum area increased from 20,000 to 30,000 sq.ft if public sewer and water are not available. R-2 minimum area increased from 11,250 to 15,000 sq.ft. if public sewer or water are not available, and 30,000 sq.ft. if neither is available.	Comprehensive plan says that areas not presently serviced are planned to be sewered within five years.
Upper Providence Township	Planning and Zoning Code Ordinance 198 – December 14, 1989 Comprehensive Plan – October 1989	Requires connection to public sewer if accessible. Requires installation of sewers in conformance with Act 537 Plan. Ch. 1052 regulates community on-lot systems. Comp plan notes problems with many failing OLDS.	No	

Source: Municipal zoning ordinances, 2003

institutional, and open space. Residential zoning includes low-density, medium-density, high-density, townhouse, apartment, and mobile home districts. Lot sizes range from 5,000 sq. ft. to 20,000 sq. ft. for detached residential dwellings. Densities for townhouses, apartments, and mobile homes range from 6 to 12 units per acre.

The Township's subdivision and land development ordinance requires that "the developer shall provide the most effective type of sanitary sewage disposal consistent with the natural features, location, and proposed development of the site." Connection to a public sewer is listed as a preferred method of disposal, followed by the provision for a community disposal system or treatment facility by the developer, followed by capped sewers with approved OLDS. On-lot sewage disposal is listed as acceptable but the least desirable method of disposal.

Aston Township's Act 247 comprehensive plan of 1987 outlined future land use, which is consistent with the current zoning maps. The plan recommended additional regulations for floodplain and steep slope development. While the plan recommends open space provisions, they are not reflected on the Township's zoning map. The plan also proposes additional public sewer lines, including a new interceptor along Chester Creek tying into the Middletown sewer system.

Bethel Township

Bethel Township's zoning code allows for a variety of land uses. They include different density residential districts, light industrial districts, and commercial districts. Significant areas of land are assigned "tank" zoning and accommodate tank farms for local refineries. For any new construction, the Township requires 40,000 sq. ft. lots in its R-1 district for those areas where public water and sewer are not available. When public utilities are available, the lot size can be decreased to 30,000 sq. ft. High-density development lots range from 2,000 sq. ft. for townhouses to 4,000 sq. ft. for single-family semi-detached homes.

The subdivision and land development ordinance of 1977 requires developers to connect to public sewers, where available. For areas where public sewers are not available, the following methods are acceptable, listed in order of desirability: community sewer and treatment plant, capped sewers with temporary OLDS, on-lot facilities of various types, or other disposal methods. The ordinance requires soil percolation tests to determine soil suitability for OLDS. All proposed connections to a public sewer system and OLDS must be certified by the Township.

The latest planning study for Bethel Township was completed in 1977. This study indicated the necessity of public sewers in all but low-density residential districts due to "unsatisfactory subsurface conditions." The study called for future land development to be coordinated with public sewer development. To minimize the Township's costs for sewers, the Future Land Use Plan chapter of the study suggests guiding development into patterns that can be most efficiently sewered. The plan also suggested tying any future sewers in some areas south of Naamans Creek Road to the

New Castle County, Delaware sewer system and sewers in the easternmost part of the Township to the sewer system in Upper Chichester.

Brookhaven Borough

Brookhaven Borough's zoning ordinance allows for a wide range of zoning districts and associated residential and nonresidential densities. Single dwelling residential districts allow for lots ranging from 10,800 sq. ft. to 3,500 sq. ft. Residential zoning also includes several types of apartment, special, and townhouse districts with densities ranging from 4 to 17 units per acre. Other districts recognized by zoning ordinances are commercial districts of various densities, a special use district, a park-recreation district, and a floodplain district.

The Borough's comprehensive plan was prepared by DCPD in 1991. The plan indicated that as of 1990, the Borough of Brookhaven was almost entirely developed. Therefore, there was no anticipated increase in sewer volumes, at the time conveyed to three facilities: the Borough's own Brookhaven STP, the SWDCMA plant in Aston, and DELCORA's plant in Chester City. The plan recommended formalizing plans for bypassing the Brookhaven STP due to possible future problems resulting from the age of the facility. The plan also recommended that Brookhaven Borough apply for a PENNVEST loan to correct defects and problems in the existing sanitary sewer system.

Chadds Ford Township

The Chadds Ford zoning map of 1985 indicates that the majority of the Township is dedicated to low-density (2-acre lots) residential districts. The only notable exceptions are areas along Route 1 and Route 202, which allow for some higher density residential, multi-family residential, office, business, and light industrial districts. Residential developments served by a public sewer system are allowed to reduce lot sizes to 1 acre Districts served by both public sewer and water have a minimum lot size of 0.5 acre. Apartment district density is no more that 12 units per acre. In addition, areas along Brandywine Creek and tributaries are designated as floodplains.

The Chadds Ford Township (at the time Birmingham Township) comprehensive plan of 1973 proposed that 67.5% of the Township's land use be dedicated to low-density residential developments, with 11.5% to floodplains, 7.7% to commercial, 4.1% to protected open space, 3.2% to medium-density residential, and 3.1% to historical areas. The remaining 2.9% were to be distributed between transportation and utilities, light industrial, and high-density residential uses. The plan indicated that the Township's soils have limited ability for OLDS and, therefore, suggested investigation of package plants. The plan warned against development patterns that would "needlessly increase the installation cost of these future utilities or precipitate their premature and uneconomic installation."

The Chadds Ford Township subdivision and land development ordinance of 1985 requires that developments be connected to a public sanitary sewer system where

accessible and available. Where systems are not yet available but are planned in the future, the developer shall install and cap sewer lines and provide other facilities necessary for future connection. When no such options are available community or private OLDS are permitted. The ordinance requires developers to submit an objective description of the proposed on-site system. The description has to include soils and percolation test data.

Chester Heights Borough

Chester Heights Borough's zoning ordinance allows for a wide range of zoning districts and associated residential and nonresidential densities. Single dwelling residential districts allow for lots ranging from 1.5 acres to 0.75 acre. Residential zoning also includes apartment, mobile home, and PRD districts. Mobile home parks are required to have a maximum of 4 units per acre. Other districts recognized by the zoning ordinance are business, laboratory/light office use, church, school, cemetery, and communications facility overlay.

The Borough's comprehensive plan was adopted in 1971. The plan recommended utilization of small package plants for apartment and PRD zones (i.e., multi-family dwellings) until public sewage treatment becomes available. Single-family zoning was to be based on no less than 1-acre lot size to meet state objectives for proper on-lot disposal.

The Chester Heights Borough subdivision and land development ordinance of 1997 requires developers to provide the "highest type of sanitary sewage disposal facility consistent with existing physical, geographical, and geological conditions."

Concord Township

Concord Township's zoning ordinance allows for a wide range of zoning districts, including a variety of single-family, apartment, PRD, planned active adult community, and mobile home districts. Residential lot sizes range from 15,000 sq. ft. to 1 acre. Other districts recognized by the zoning ordinance are planned business and commercial, business park, light industrial, planned industrial park, special use (swimming club), and planned laboratory office.

The Township's comprehensive plan was adopted in 2000. The plan describes the existing sewage system and indicates which areas can expect public sewer service. The plan indicates the possibility of future extension of public sewer services to existing neighborhoods that are currently lacking it. Future development is encouraged to occur in close proximity to existing utility lines.

Concord's subdivision and land development code requires that all lots be connected to public sewers where accessible and available. Where systems are not yet available but are planned in the future, the developer shall install and cap sewer lines and provide other facilities necessary for future connection. When no such options are available, community or private OLDS are permitted. The developer is required to

provide evidence of feasibility and satisfactory operation of the system to be utilized. OLDS are to be installed no closer than 200 feet from any adjacent property line. Soil suitability and percolation tests are required.

Edgmont Township

Edgmont Township's zoning ordinance of 1997 distinguishes several types of residential districts including rural/agricultural, rural, suburban, retirement, and planned. Lot sizes vary from 4 acres for the rural/agricultural district R-1 to 20,000 sq. ft. in the suburban residential district R-4. Retirement district R-5 is no more than 3.5 units per acre. PRD areas allow for lot sizes as small as 7,500 sq. ft. for the PRD-3 district, designed for single-family detached, duplex, or twin units. Other uses permitted by the zoning ordinance are neighborhood commercial, highway commercial, planned commercial/light industrial, planned office center, light industrial, and outdoor recreation.

The Township's subdivision ordinance requires "dwellings and/or lots within a subdivision or land development [to be] connected with a public sanitary sewer system where accessible and available." Where sewage facilities are planned but not yet available, the developer must install facilities including laterals, force mains, capped sewers, etc. to each lot. When sanitary sewers are not to be constructed, OLDS are permitted, provided that they are installed in accordance with state and local regulations. The landowner or developer is required to provide evidence of feasibility and satisfactory operation of the system to be utilized.

Edgmont Township's comprehensive plan of 2000 states that public sewer service areas in relation to existing needs and planned growth areas is one of its objectives. However, the plan also affirms the Township's determination to continue relying primarily on on-lot or other alternative systems for domestic waste disposal, especially in the western areas. Edgmont Township's strategy for reaching the latter goal is to "minimize infrastructure expansion on the western side of Ridley Creek State Park by relying primarily on … on-site and other approved alternative systems for domestic waste disposal," which in its turn helps to "promote groundwater recharge." The plan's recommendations are consistent with the objectives and strategies stated above and promote utilization of existing sewage systems or alternative OLDS.

Media Borough

Media Borough is almost entirely built out at the present time, and any future growth can only involve redevelopment of existing districts. Present zoning layout allows for several residential densities, educational, recreational, and community use, office use, retail/office/apartment use, highway business office use, and industrial use. Residential lots range from 1,750 sq. ft. for a multi-family dwelling to 6,600 sq. ft. for single-family detached homes. The zoning ordinance also delineates historic districts within the Borough.

The Borough's comprehensive plan dates back to 1986 and, due to the nature of the area, it concentrates mainly on redevelopment and revitalization rather than new development. No changes to wastewater handling were recommended at the time.

Middletown Township

Middletown Township's zoning ordinance allows for a wide range of zoning districts including a variety of single-family residential, planned retirement community, and PRD. Lot sizes range from 0.25 acre to 1 acre. Minimum lot size in the same zoning district can vary depending on availability of public sewer and water. Other districts recognized by zoning ordinances are institutional, outdoor recreation, special use, business, neighborhood shopping center, major shopping center, planned business center, office, office campus, and manufacturing/industrial. Zoning also allows for transferable development rights (TDR), a program that directs growth to preferred locations by the sale and purchase of a property's development rights.

The Township's subdivision and land development ordinance, revised in 1982, requires that all subdivisions or land developments be connected to public sewers where available and accessible. If public sewers are not available immediately but are planned in the future, all necessary laterals shall be installed and capped. In areas with no plans for public sewer systems, a separate on-site sewage disposal facility shall be provided for each lot.

Middletown Township's comprehensive plan of 2001 notes that the Township's public sewer system is tied into an intermunicipal system with shared facilities. The plan's recommendations proposed studies of current and future demands on the major interceptors and pump stations, implementation of an I&I elimination plan, assistance to neighborhoods in extending public sewer service to areas where it is currently lacking, and extension of the treatment agreement with SWDCMA. The comprehensive plan outlines strategies to promote a balance of developed and open areas. A low-intensity residential development category assigned to vacant parcels within areas of residential development is intended to guide housing development to areas where lots and infrastructure already exist.

Newtown Township

Newtown Township's zoning ordinance, (Chapter 172 as amended September 9, 2002) allows for minimum lot sizes that range from 60,000 sq. ft. in the R-1 residence district to 12 units per acre in the A-O apartment office district. Lots without public water are required to be a minimum of 12,000 sq. ft. There are no requirements in the zoning ordinance that address minimum lot sizes for developments that are not served by public sewer. Nonresidential districts permitted by the ordinance include office, commercial, special use, and industrial.

Newtown Township's subdivision ordinance of 1995 (Chapter 148 as amended September 25, 2000) requires lots where both water and sanitary sewage disposal are

provided by OLDS to have a minimum area of 30,000 sq. ft. and a minimum width, measured at the building line, of 150 ft. The ordinance requires each property to be connected "to a public sewer system if accessible by gravity." In areas where sewers are not currently available but are probable within ten years, new developments must include capped sewers. On-site sewer systems are permitted in conformance with state and Township regulations where they can be accommodated safely. Soil percolation tests are required in these cases. The ordinance includes a general statement that the proposed method of sewage disposal shall be in accordance with the Township's Act 537 Plan.

The Newtown Township comprehensive plan was prepared in 2001. The plan notes soil limitations for subsurface disposal in western and northern portions of the Township. Public sewers in the Township convey wastewater to RHM and DCJA. The sewer mains responsible for this transport reached their hydraulic capacity in the mid 1990s. Despite that, some development has proceeded in the northern and southern portions of the Township employing both individual and community on-lot wastewater disposal methods.

In recent years new developments have increasingly used small package plants for their wastewater needs. This trend allows planning for development in areas where public sewers are not available and soils are not suitable for subsurface disposal. The comprehensive plan recommends exploring centralized sewer options, such as extension of DELCORA's Crum Creek Interceptor into the Township. A limited number of package plants should be planned for the future. Careful monitoring of subsurface systems is necessary, with possible connections to package plants and a central sewer in case of future failures.

Rose Valley Borough

Rose Valley Borough is almost entirely built out, with only one property remaining with subdivision potential. Rose Valley's zoning ordinance distinguishes only three types of residential development: Zone A (1-acre lots), Zone B (0.5-acre lots), and Zone C (30,000 sq. ft. lots). There are no commercial or industrial properties in the Borough, and the only open space along Ridley Creek is assigned a wildlife preserve status.

Due to the fact that scarcely any development occurred in the Borough in the past decades, the latest planning document in Rose Valley dates back to 1971. The comprehensive plan found the Rose Valley STP adequate at the time and projected its continued use for the next ten to fifteen years. The plan acknowledged County recommendations for the future phasing out of that facility. As of today, the Borough's plant is still in operation.

Thornbury Township

Thornbury Township's zoning ordinance allows for several types of residential developments, planned apartment and residential developments, institutional,

institutional/residential, limited industrial, commercial, and mobile home park districts. Lot sizes in residential areas vary from 87,000 sq. ft. for the R-1 district to 7 units per acre in the planned apartment district. The zoning map also indicates two large areas taken up by quarries.

The Township's subdivision and land development ordinance of 2000 calls for provisions by the developer of the "highest type of sanitary sewage disposal facility consistent with existing physical, geographical, and geological conditions and in conformance with all applicable Township ordinances and state and County regulations."

Thornbury Township's comprehensive plan of 1993 identified areas with significant limitations for OLDS. At the time of the plan's publication, Thornbury was largely unsewered and relied primarily on OLDS. No municipality-owned facilities existed in the Township. The plan recommended centralized sewer facilities to be designed to correspond with the proposed land development. It also suggested continuation of on-site disposal for most sites with small package plants in all new large-scale developments.

Upper Chichester Township

The zoning ordinance of Upper Chichester Township distinguishes several types of residential developments, such as low-density, medium-density, high-density, townhouse, apartment, mobile home, and planned retirement community. Minimum lot sizes are 20,000 sq. ft. in the R-1 district, 11,250 sq. ft. in the R-2 district, and 5,000 sq. ft in the R-3 and mobile home districts. Density for the townhouse district and apartment district is not to exceed 7 units and 12 units per acre, respectively. Zoning maps also show neighborhood and highway commercial districts, an industrial commercial district, and an industrial district.

The Township's subdivision and land development ordinance requires developers to provide the "most effective type of sanitary sewage disposal consistent with the natural features, location, and proposed development of the site." The preferred method of disposal is a connection to a public sewer system, followed in order of preference by provision of a community treatment facility, capped sewers with temporary on-lot facilities, and OLDS. The Township requires the connection of failed OLDS within 250 feet of public sewer.

The comprehensive plan for Upper Chichester Township was prepared in 1990 and identified areas to be sewered in the near future. The plan suggested tying those areas into the SDCA system.

Upper Providence Township

Minimum residential lot sizes specified in Upper Providence Township's zoning ordinance range from 43,560 sq. ft. in the R-1 district to 5,000 sq. ft. for single-family residences and 2,000 sq. ft. for apartments in the R-6 district. Lot sizes are not predicated

on the availability of public water or sewer. Nonresidential districts include business, limited industrial, planned office campus, recreational, and open space.

Upper Providence Township's subdivision ordinance requires each property to be "connected to a public sewer system, if accessible." When sewers are not available but are planned for extension, the developer is required to install capped sewer laterals.

The Upper Providence Township comprehensive plan was developed in 1989. The plan recommended regulation of the intensity of new development in order not to exceed the capacity of sewer facilities. The plan also drew attention to OLDS and the necessity for proper design of new subsurface discharge systems and for addressing problems of existing systems. The plan suggested investigation of opportunities for extending sewer lines to cluster tracts in the Ridley Creek watershed and the possibility of utilizing the Crum Creek Interceptor.

Major Inconsistencies

During the review of the existing municipal ordinances, inconsistencies noted are included in Table 5-4.

OTHER ENVIRONMENTAL PLANS

Water Quality Requirements

Pennsylvania regulations specifically address water quality standards in 25 Pa. Code § 93. Chapter 93 sets statewide water uses for all surface water as shown in Table 5-5. Waterbody-specific uses for Delaware County are shown in Table 5-6.

Chapter 93 water quality criteria are associated with the statewide water uses listed previously and apply to all surface waters unless otherwise indicated. The criteria specify such parameters as pH, temperature, dissolved oxygen, color, bacteria count, nutrients, priority pollutants, and others.

Clean Water Act Section 305(b) requires a report on all impaired waters of the Commonwealth. Section 303(d) further evaluates these findings to determine which waters still would not support specified uses even after the appropriate required water pollution technology has been applied. Section 303(d) also establishes the total maximum daily load (TMDL) program. In 1997, EPA and DEP agreed to a 12-year schedule to develop TMDLs for 575 impaired 303(d) list water segments. In 1998, 403 more water bodies were added to the 303(d) list.

None of the streams in Delaware County have approved TMDLs as of 2002. Several tributaries of Chester Creek are currently proposed for de-listing from the 303(d) list. Section 303(d)/305(b) streams in western Delaware County by major watersheds as listed in DEP watershed notebooks are presented in Table 5-6.

TABLE 5-5

STATEWIDE WATER USES

Symbol	Use
Aquatic Life	
WWF	Warm Water Fishes
Water Supply	
PWS	Potable Water Supply
IWS	Industrial Water Supply
LWS	Livestock Water Supply
AWS	Wildlife Water Supply
IRS	Irrigation
Recreation	
B	Boating
F	Fishing
WC	Water Contact Sports
E	Aesthetics

Source: Pennsylvania Code, Title 25,
Chapter 93.4, Table 2

State Water Plan

The Pennsylvania State Water Plan was originally developed in the 1970s and divided the state's major river basins into twenty smaller units (subbasins) for planning purposes. Most of these subbasins were further divided into watershed areas that range in size from 100 to 1000 square miles. Western Delaware County is located in Subbasin 3 (Lower Delaware River). Watershed Area G (Darby-Crum Creeks) covers most of the area, while a small portion of the County bordering Chester County falls into Watershed H (Brandywine Creek).

The State Water Plan for Subbasin 3 was published in 1983. It addressed a general understanding of water resources and examined problems and viable solutions. The plan identified high water usage in the area and noted rapid population growth in Delaware County. The growing problem of community development in floodplains was also addressed. Adverse effects of municipal and industrial discharges as well as erosion and sedimentation on surface water quality were discussed. Chester Creek and Ridley Creek were specifically identified as those affected by inadequately treated waste discharges and malfunctioning septic tanks. Water quality in Crum Creek and the upper reaches of Darby Creek was rated good and excellent, respectively, while the lower reaches of Darby Creek received only poor marks. Elevated nutrient levels from agricultural runoff affected water quality in Red Clay Creek and White Clay Creek while water quality in the upper reaches of the East and West Branches of Brandywine Creek was rated as good. The plan identified upgrades of municipal wastewater treatment facilities as one of the major solutions to water quality problems in these watersheds.

TABLE 5-6

303(D)/305(B) LISTED STREAMS IN DELAWARE COUNTY

Stream	Protected Water Uses	Drainage Area (sq. mi.)	Miles Impaired	Miles Attained	Causes	Sources of Impairment	Comments
Streams in Subbasin 03G							
2-Darby Creek	CWF, MF, TSF	77.2	10.09 Main stem; 3.55, 4 UNTs	10.01 Upper main stem; 12.01, 16 UNTs	Habitat modifications/ alterations; siltation & water/flow variability	Urban runoff/ storm sewers	*CWF, MF above Rt. 3, TSF, MF below Rt. 3*
3-Little Darby Creek	CWF, MF	3.61	1.73	1.01	Water/flow variability	Urban runoff/storm sewers	
4-Julip Run	CWF, MF	0.66		1.16			
4-Abrahams Run	CWF, MF	0.32		0.7			
4-Wigwam Run	CWF, MF	0.32		0.64			
3-Camp Run	CWF, MF	0.26		0.72			
3-Miles Run	CWF, MF	0.24		0.57			
3-Foxes Run & 2 UNTs	CWF, MF	1.49		3.49			
3-Ithan Creek & 2 UNTs	CWF, MF	7.39		4.93			
4-Browns Run & one UNT	CWF, MF	0.33		1.01			
5-Hardings Run	CWF, MF	1.16		0.98			
4-Kirks Run	CWF, MF	0.5		0.92			
4-Meadowbrook Run & 3 UNTs	CWF, MF	2.37		3.58			

TABLE 5-6

303(D)/305(B) LISTED STREAMS IN DELAWARE COUNTY (CONTINUED)

5-Valley Run	CWF, MF	0.6		1.07			
4-Langford Run	WWF, MF	1.41	1.73		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
3-Whetstone Run & one UNT	WWF, MF	1.1	1.46		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
3-Cobbs Creek & 4 UNTs	WWF, MF	22.3	18.75		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers, & municipal point sources	
4-Indian Creek	WWF, MF	3.96	0.66		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
5-East Branch Indian Creek	WWF, MF	1.75	2.64		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
5-West Branch Indian Creek	WWF, MF	1.75	2.72		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
3-Hermesprota Creek	WWF, MF	1.83	2.15		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
3-Muckinipates Creek & 2 UNTs	WWF, MF	4.29	7.3		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
3-Stony Creek & one UNT	WWF, MF	2.97	6.04		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
2-Crum Creek	HQ-CWF, CWF, WWF	38.3	7.62 Main stem; 3.30, 3 UNTs	13.81 Upper main stem; 27.4, 32 UNTs	Excessive algal growth from AG, habitat modifications/alterations, siltation	Urban runoff/storm sewers, flow/water regulation/ modification	*HQ-CWF upper basin in Chester Co., WWF below Springton Res.*
3-Preston Run	CWF	0.68		1.42			
3-Hunter Run & 2 UNTs	HQ-CWF	1.6		3.51			
3-Trout Run & 4 UNTs	WWF	2.79	5.45		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	

TABLE 5-6

303(D)/305(B) LISTED STREAMS IN DELAWARE COUNTY (CONTINUED)

3-Hotland Run	WWF	1.01	0.32 Main stem; 0.9, 1 UNT	0.77, 1 UNT	Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
3-Dicks Run	WWF	0.9		2.01			
3-Little Crum Creek	WWF	3.3	3.68		Habitat alterations, siltation, water/flow variability	Habitat modification, urban runoff/storm sewers	
2-Ridley Creek & 60 UNTs	HQ-TSF, TSF, WWF, MF	37.9		75.64			*HQ-TSF upper basin above Media Water Intake*
3-Hunters Run	HQ-TSF	1.76		1.51			
3-Dismal Run & 2 UNTs	HQ-TSF	1.63		3.67			
3-Spring Run at Media & 1 UNT	HQ-CWF	0.79		1.79			
3-Vernon Run & 1 UNT	HQ-CWF	0.79		2.31			
2-Chester Creek	HQ-CWF, CWF, TSF, MF, WWF	66.4	12.4 Main stem; 2.88, 5 UNTs	8.79 Main stem; 22.64, 26 UNTs	Habitat alterations, siltation, water/flow variability	Flow regulation/modification, municipal point source, urban runoff/storm sewers	*CWF, TSF above Duttons Mill Rd., WWF below Duttons Mill Rd.*
3-East Branch Chester Creek & 7 UNTs	TSF	35.6		17.15			
3-Rocky Run & 4 UNTs	HQ-CWF, MF	3.13		6.27			
3-West Branch Chester Creek & 25 UNTs	TSF, MF	19.1		28.95			
4-Green Creek	CWF, MF	4.18	0.36, 1 UNT	3.52 Main stem; 5.75, 7 UNTs	Organic enrichment/low DO, nutrients, suspended solids	Package plants	

TABLE 5-6

303(D)/305(B) LISTED STREAMS IN DELAWARE COUNTY (CONTINUED)

3-Chrome Run & 4 UNTs	TSF, MF	1.78		4.89			
3-Baldwin Run	WWF, MF	1.85					
2-Stoney Creek	WWF	0.8		2.83			
2-Marcus Hook Creek & 5 UNTs	WWF	5.22	10.21		Land disposal-metals, siltation	Urban runoff/storm sewers	
2-Naamans Creek & 2 UNTs	WWF	7.88		4.94			
3-Spring Run at Gardendale	WWF	0.95		1.78			
3-East Branch Naamans Creek & 1 UNTs	WWF	1.82		4.57			
3-West Branch Naamans Creek & 1 UNT	WWF	1.78		3.94			
Streams in Subbasin 03H: 303d/305b Listings							
3-Brandywine Creek	HQ-TSF, MF	304	1.28, one UNT	24.88 main stem & 22 UNTs	Nutrients		
4-Brinton Run	WWF, MF	1.53					
4-Harvey Run & 8 UNTs	WWF, MF	3.88		8.77			
4-Beaver Creek at Granogue, DE, & 4 UNTs	WWF, MF	4.17		6.61			

Notes:
HQ – High Quality
UNT – Unnamed Tributary
CWF – Cold Water Fishes
TSF – Trout Stocking
WWF – Warm Water Fishes
MF – Migratory Fishes

Source: Adapted from Pennsylvania's 2000 303(d) list

These issues are still somewhat relevant to western Delaware County twenty years later. Positive changes since 1983 include major improvements to existing treatment facilities and construction of new ones, more efficient OLDS, and better control of erosion and sedimentation and nonpoint pollution runoff. However, these positive effects were offset by increasing volumes of wastewater and urban runoff due to population growth, aging and failing OLDS, and I&I in municipal sewers resulting in overflows and capacity problems for treatment facilities.

Watershed G, known as the Darby-Crum Creeks watershed, has an approximate drainage area of 231 square miles and also includes Ridley Creek, Chester Creek, and other tributaries flowing directly into the Delaware River Estuary from Tinicum to Marcus Hook. The watershed is characterized by a combination of point and nonpoint pollution sources including urban runoff, stormwater management, streambank erosion, hydromodification, CSOs, heavy industry, and commercial development. Many developments in this watershed are encroaching on floodplains, creating a flooding hazard during storm events. For example, severe flooding occurred in the lower portions of the watershed during record rainfall from Hurricane Floyd in 1999.

Watershed H, known as the Brandywine Creek watershed, covers about 301 square miles and also includes White and Red Clay Creeks and the headwaters of the Christina River in Delaware. Water quality in this watershed is subject to factors similar to those of Watershed G. There is currently a "no fish consumption" advisory for parts of Brandywine Creek due to the presence of the pesticide Chlordane.

The Pennsylvania Water Resources Conservation and Protection Act is proposed legislation that will direct DEP to complete an update of the State Water Plan in three years and produce regular updates every five years thereafter. The Act will also require the water plans to identify critical water planning areas, create a water conservation program, and set water well construction standards.

WESTERN DELAWARE COUNTY SEWAGE FACILITY PLANNING NEEDS

General Sewage Facilities Needs

The sewage facilities needs of western Delaware County are widely varied and are addressed specifically in the individual municipal Act 537 plans. However, the needs can be generally categorized into four groups for this plan based upon two criteria: the availability of existing public sewage facilities (both conveyance and treatment) covering the majority of the municipality and projected growth through the planning horizon to 2025. A matrix shown in Table 5-7 depicts the four categories and the category of each municipality in the western planning area.

Category A municipalities currently have a well-developed sanitary sewer collection system covering most of the municipality (thus few OLDS) and are projected to have significant growth by 2025. In general, the sewage needs of this area would be

TABLE 5-7

SEWAGE FACILITIES NEEDS CATEGORIZATION MATRIX

Criteria	Category A	Category B	Category C	Category D
Availability of Existing Public Sewage Facilities	Yes	Yes	No	No
Projected Population Growth Greater than 25%	Yes	No	Yes	No
Municipalities	Bethel Twp.	Aston Twp. Brookhaven Boro Media Boro Middletown Twp. Rose Valley Boro Upper Chichester Twp. Newtown Twp.	Chadds Ford Twp. Chester Heights Boro Concord Twp. Edgmont Twp. Thornbury Twp.	Upper Providence Twp.
Needs	Treatment capacity Collection system capacity	Treatment capacity Collection system capacity	Treatment capacity Collection system capacity Maintain OLDS treatment capacity	Treatment capacity Collection system capacity Maintain OLDS treatment capacity

Source: Weston Solutions, Inc., 2003

sufficient treatment capacity for existing and future flows and sufficient collection capacity to transport the existing and future flows to treatment facilities.

Category B municipalities also currently have a well-developed sanitary sewer collection system covering most of the municipality (thus few OLDS) and are **not** projected to have significant growth by 2025. In general, the sewage needs of this area would be sufficient treatment capacity to meet existing demand and maintaining sufficient collection capacity to convey these flows to treatment facilities.

Category C municipalities currently do not have a widely developed public sanitary sewer collection system, and the residential population is expected to grow significantly by 2025. In this category, the sewage needs of this area are widely varied. Some municipalities in this category have community treatment systems (package treatment plants), some have public sanitary sewer and treatment systems, and others have a high percentage of OLDS. The sewage needs for this category include sufficient public treatment and collection capacity for existing and future flows, sufficient treatment capacity for community systems, and sufficient treatment capacity for both existing and proposed areas served by OLDS including failing OLDS either individually or on a community-wide (single development) basis.

Category D municipalities currently do not have a widely developed public sanitary sewer collection system serving the municipality, and the residential population is **not** expected to grow significantly by 2025. These municipalities typically have developed residential communities served by OLDS, and remaining lands available for development are limited. The sewage needs for this category would include sufficient public treatment and collection capacity for existing flows, sufficient treatment capacity for community systems, and sufficient treatment capacity for existing areas served by OLDS including failing OLDS either individually or on a community-wide (single development) basis.

Municipality Specific Sewage Facilities Needs

Sewage needs based upon anticipated residential population and employment growth have been projected by DVRPC from the Census 2000. Table 5-8 estimates the increase in sewage demand generated by the projected increases in population and employment. The 2000 and 2025 Residential Sewage Demand columns were estimated by multiplying the census residential population for 2000 and the 2025 projection (Table 2-3) by the residential demand rate of 95 gallons per day (gpd)/person based on flow records from SWDCMA and SDCA. The 2000 and 2025 Commercial/Light Industrial Sewage Demand columns were estimated by multiplying the projected 2000 and 2025 employment (Table 2-5) by the commercial/light industrial demand based on 20 gpd/employee. The Residential Sewage Demand Increase column was estimated by subtracting the 2000 residential sewage demand from the projected 2025 residential sewage demand. The Commercial/Light Industrial Sewage Demand Increase column was estimated by subtracting the 2000 commercial/light industrial demand from the projected 2025 commercial/light industrial demand.

The next column is the percentage of OLDS in each municipality based upon the DCPD survey of SEOs. The project sewage demand assumes that the percentage of OLDS in each municipality will remain unchanged, and, thus, a similar portion of the projected residential sewage demand will be served by OLDS. Therefore, the final column is computed by adding the commercial/light industrial demand increase to the portion of the residential sewage demand increase that is not served by OLDS.

The previous table was provided as a reference point for the sewage needs of western Delaware County in terms of an estimate of current (2000) sewage demand and the projected demand. The ultimate responsibility, however, for providing sewage facilities planning lies at the local municipal level. Thus, the most detailed information on sewage facilities planning can be found in the individual municipal Act 537 plans. Several western municipalities are currently conducting major revisions to their individual plans. While specific details are not currently available, information should be forthcoming within the next year.

TABLE 5-8

SEWAGE DEMAND GROWTH ESTIMATE FOR PUBLIC SEWAGE SYSTEMS BY MUNICIPALITY

Municipality	2000 Residential Sewage Demand[1,2] (gpd)	2000 Com/Lt. Ind. Sewage Demand[3,4] (gpd)	2025 Residential Sewage Demand[1,2] (gpd)	2025 Com/Lt. Ind. Sewage Demand[3,4] (gpd)	2025 Residential Sewage Demand Increase[1] (gpd)	2025 Com/Lt. Ind. Sewage Demand Increase[3] (gpd)	Percent of Mun. Served by On-Lot Systems[5]	2025 Projected Sewage Demand Increase[6] (gpd)
Aston Township	1,539,285	128,600	1,829,700	189,400	290,415	60,800	1	348,311
Bethel Township	609,995	21,200	906,300	37,000	296,305	15,800	10	282,475
Brookhaven Borough	758,575	47,400	756,200	59,000	-2,375	11,600	0	9,225
Chadds Ford Township	301,150	143,200	452,200	259,600	151,050	116,400	50	191,925
Chester Heights Borough	235,695	42,000	379,050	64,800	143,355	22,800	75	58,639
Concord Township	1,067,705	98,600	1,607,400	160,400	539,695	61,800	50	331,648
Edgmont Township	372,210	30,400	606,100	56,200	233,890	25,800	75	84,273
Media Borough	525,635	227,200	480,700	240,200	-44,935	13,000	0	-31,935
Middletown Township	1,526,080	214,200	1,680,550	241,400	154,470	27,200	2	178,581
Newtown Township	1,111,500	161,800	1,153,300	219,800	41,800	58,000	30	87,260
Rose Valley Borough	89,680	2,600	95,950	2,600	6,270	0	10	5,643
Thornbury Township	549,765	50,000	788,500	80,400	238,735	30,400	65	113,957
Upper Chichester Township	1,599,990	62,800	1,933,250	81,200	333,260	18,400	1	348,327
Upper Providence Township	998,355	61,600	1,089,650	76,600	91,295	15,000	45	65,212
Western Municipalities	**11,285,620**	**1,291,600**	**13,758,850**	**1,768,600**	**2,473,230**	**477,000**	**N/A**	**2,073,541**

Notes: [1]Residential demand based on 95 gpd/person.

[2]Residential demand is cumulative including areas served by public sewers and OLDS.

[3]Commercial / light industrial demand based upon 20 gpd / employee.

[4]Does not include any heavy industrial users.

[5]Based upon SEO survey conducted by DCPD.

[6]Does not include OLDS.

Source: DVRPC, Bulletin No. 73, March 2002; Weston Solutions, Inc., 2003

CHAPTER 6

PLANNING AND FACILITIES ALTERNATIVES AND EVALUATIONS

INTRODUCTION

A large body of information concerning existing public and private sewage facilities, sewage infrastructure needs, and planning efforts to date has been provided in previous sections of this document. The purpose of this chapter is to use the information gathered to develop alternatives and to evaluate and recommend improvements that can be made to the existing sewage collection, conveyance, and treatment systems serving western Delaware County.

Municipal and local initiatives are the key to wastewater planning in western Delaware County. Therefore, this chapter provides only general recommendations, while emphasizing the importance of local and intermunicipal planning, communication, and cooperative services. In remarks delivered at EPA's Forum on Closing the Gap: Innovative Responses for Sustainable Water Infrastructure on January 31, 2003, the Assistant Administrator of the Office of Water, G. Tract Mehan, III, stated that EPA has found that cost savings can be achieved by small systems through consolidating ownership or management with other small systems. While consolidation is not always an option, cooperative management can "achieve a more sustainable level of technical, financial, and managerial capacity." DEP increases levels of cost reimbursement for programs that are shared by more than one municipality.

In addition to significant cost savings and increased program expense reimbursement, shared service programs provide consistent standards for design, operation, and violation enforcement. Consistent application of standards ensures that developers cannot "shop" for a municipality where environmental regulations are lax. They can also assure the public that all situations are treated the same regardless of the involved parties.

Public Facilities

Although a significant portion of wastewater collection, conveyance, and treatment in western Delaware County is provided by public facilities, issues facing municipalities cannot be generalized because they vary greatly due to the diverse history of wastewater planning and development in the study area. Eastern portions of the study area, which historically had public treatment facilities, deal with many problems similar to those explored in other developed urban/suburban areas. These problems include aging of the systems and I&I. Act 537 updates for municipalities such as Aston, Bethel, Brookhaven, Middletown, Upper Chichester, and Upper Providence noted I&I as a problem at least for a part of their systems.

Centrally located facilities are facing capacity limitations resulting from old infrastructure and growing population. The most prominent example is the SWDCMA,

which is experiencing many difficulties typical of older systems while coping with increasing population in parts of the Authority's service area. The difficulties have necessitated the development of a corrective action plan.

The newer public facilities are located in or are being planned for the western part of the study area. Recent population growth and future projections are forcing municipalities to plan for new collection and treatment systems. New treatment technologies and modern infrastructure differentiate these systems from those at the older facilities, and newer facilities typically have fewer operational problems. However, municipal cooperation and distribution of flows beneficial to the entire region are still lacking. Only recently have some western municipalities started developing agreements that will allow for such cooperation, including Concord and Thornbury; Newtown, Upper Providence, and Edgmont; SWDCMA, Middletown, Upper Chichester, Brookhaven, Chester Heights, Chester Township, and Aston; and SCDA and DELCORA.

Every publicly-owned facility is required to comply with state and federal regulations. Annual reports, often referred to as Chapter 94 Reports, after Pennsylvania Code Chapter 94 Municipal Wasteload Management, must be submitted to DEP by March 31 each year. These reports include monthly average flows, monthly average organic loading, future projections for flows and organic load, all sewer extensions built in the previous year, a discussion on the condition of the facility, as well as repair and maintenance programs and report of industrial discharges into the system.

Public wastewater collection, conveyance, and treatment facilities are gaining in importance as a treatment option for western Delaware County even though there are challenges in establishing them in suburban communities. Some of these challenges include assimilative capacity of receiving streams, disruptions for the installation of sewers, siting of treatment facilities, etc.

Private Facilities

Many businesses, communities, and individual homeowners in western Delaware County do not have access to public sewer systems, and, due to soil limitations, lot sizes, or other problems, they cannot use OLDS. Nonmunicipal (private) surface discharge facilities are widely used in the western parts of the study area where public sewer availability is limited. Many communities and businesses in municipalities such as Chadds Ford, Chester Heights, Concord, and Thornbury rely on private treatment facilities.

Some municipalities also find it economically feasible to contract operation of their treatment facilities to a private company while maintaining some control over monitoring of facility maintenance and performance. For example, the treatment plant owned by Media Borough was sold to Philadelphia Suburban's Little Washington Wastewater Company (now Aqua Pennsylvania, Inc.) in 2001. The Borough still has regular access to the facility for inspections.

Privately-owned treatment facilities fall under the same regulations as publicly-owned plants. Under Pennsylvania Code Chapter 92 National Pollutant Discharge Elimination System Permitting, Monitoring, and Compliance, each person who discharges pollutants, with the exception of sewage discharges from single-family residence sewage treatment plants, may be required to monitor and report all toxic, conventional, non-conventional, and other pollutants in its discharge, at least once a year, and on a more frequent basis if required by a permit condition. The results of this monitoring are submitted to DEP as required by a permit condition. There are no annual reporting requirements (like Chapter 94 for public facilities) for private facilities unless specifically stated in the facility NPDES permit.

Alternatives related to private facilities are typically institutional in nature in that the municipality will be providing oversight, inspection, and record keeping functions. These alternatives are discussed in more detail in Chapter 7.

ALTERNATIVES TO ADDRESS THE CONDITION OF EXISTING PUBLIC INFRASTRUCTURE

Western Delaware County occupies a unique urban fringe area between the dense urban areas of eastern Delaware County and the City of Philadelphia and the rural area of southern Chester and Lancaster Counties. Its location between these vastly different land uses is creating strong development pressure in the western municipalities. The study area faces the dual challenge of upgrading older systems and at the same time adding capacity to service an increasing population. This section provides alternatives to address the condition of the existing public infrastructure in the area.

Correct Inflow and Infiltration Problems

Parts of western Delaware County rely on older collection systems and face problems similar to eastern Delaware County municipalities. I&I increases treatment costs, and significant I&I severely limits the capacity of conveyance and treatment systems to accept flow from new development. Areas affected include Aston, Brookhaven, Bethel, Media, Middletown, Newtown, Rose Valley, and Upper Chichester. Capacity problems at the SWDCMA treatment facility are partially due to I&I issues.

Inspection and Maintenance Programs

Some municipalities opt to delegate operation and maintenance of public facilities to private companies. For example, the Borough of Media entered into an oversight agreement with the new owner of the STP which allows access for examination of operations and effectiveness of the system on an on-going basis. Scheduled inspections and maintenance can assure the public that contract-operated plants do not pose a threat to public health and the environment.

No Action

The final option for addressing the condition of existing wastewater collection, conveyance, and treatment facilities is to do nothing.

ALTERNATIVES TO DEVELOP INFRASTRUCTURE TO SERVE GROWTH AREAS

In the Municipality Specific Sewage Facilities Needs section of Chapter 5, projections of residential and industrial/commercial growth were used to estimate the demand for public treatment facilities in western Delaware County. Table 5-8 projected a need of over 2 MGD of increased capacity at public treatment facilities by 2025. Some of this treatment capacity may be obtained from I&I elimination programs in older service areas and from reduced demands in eastern Delaware County; however, a majority of the additional capacity for new service areas will likely be obtained by expansion of existing facilities or new facilities, given the distance to the public treatment facilities serving eastern Delaware County.

Increase Conveyance and Treatment Capacity at Existing Facilities

Accordingly, one alternative is to conduct a capacity analysis of each public treatment facility serving the western planning area. The goal of these studies would be to identify those facilities that currently have available capacity beyond their current permit, requiring a re-rating study, and those facilities that can economically provide additional capacity through expansion.

Increase Conveyance and Treatment Capacity with New Facilities

Another alternative to address capacity limitation problems is the construction of new conveyance and treatment facilities. As shown in Chapter 2, especially Figure 2-2, significant population growth, on-going and expected in some areas of western Delaware County, as well as conversion from OLDS or other methods of disposal to public sewers may require additional conveyance and treatment capacity in those areas impacted by failing OLDS.

Regional Balancing of Facilities' Capacity

Efficient use of existing or planned treatment capacity on the regional level can provide increased capacity to areas in need. Construction of additional conveyance systems would be required from areas without sufficient treatment capacity to a treatment facility with excess capacity. Some municipalities are already addressing regional issues in their latest Act 537 plan updates. As an example, the Newtown and Upper Providence Act 537 Plan Updates suggest joining CDCA in order to satisfy their growing wastewater treatment needs. Thornbury has an agreement with Concord to accept flows from the western portion of Thornbury Township. Feasibility of shared infrastructure can be

evaluated based on costs of construction of new treatment facilities, taking into account public health and the environment.

Reuse of Reclaimed Water

One issue associated with the expansion of treatment facilities is the ability of small receiving streams to assimilate the discharge without significantly changing the ecosystem of the stream. One way to minimize the impact to local stream ecology is the reuse of reclaimed water. Reuse of treated effluent is a direct method to reduce the surface water discharge; another is the minimization of flow to the treatment facility by the reuse of gray water. While Pennsylvania regulations do not define gray water, the State of Arizona does provide an easy-to-understand legal definition:

> R18-9-701(4) "Gray water" means wastewater collected separately from a sewage flow that originates from a clothes washer, bathtub, shower, and sink but does not include wastewater from a kitchen sink, dishwasher, or toilet."

There are many potential reuses of reclaimed water for non-potable purposes including:

- Irrigation of public parks, landscaped areas surrounding commercial/industrial developments, and golf courses
- Dust control and concrete production on construction projects
- Fire protection
- Evaporative cooling water
- Industrial process water
- Boiler-feed water
- Agricultural and nursery irrigation
- Groundwater recharge

This alternative would evaluate reuse options as part the local land development process for a new significant water user or during the planning phase for a treatment facility expansion.

No Action

The final option addressing the issues of developing infrastructure to serve growth areas is to do nothing and require developers to provide adequate disposal for their developments.

ALTERNATIVES TO COORDINATE LAND USE AND SEWAGE FACILITIES PLANNING

All of the municipalities in western Delaware County have comprehensive plans although many are more than fifteen years old. Up-to-date comprehensive plans foster

consistent land development that reflects residents' vision for their community and provides guidance for municipal ordinances in support of this vision. Comprehensive plans can also provide recommendations for municipal ordinances that promote conformance with other planning documents such as municipal Act 537 plans.

Align and Update Municipal Planning Documents

The detailed review of existing planning documents conducted for Chapter 5 revealed that many municipalities have out-of-date comprehensive plans, and some have ordinances and plans that conflict. Since these are important land planning and development tools in local development policy, this alternative recommends updating and aligning the documents, including requirements for sewage disposal.

Updating municipal planning documents will require some funds, but there are monies available to assist in the document preparation. The short-term financial impact of this work needs to be balanced against the desires of the municipalities to ensure that the visions for their communities are fulfilled.

There are two programs that may provide funding for local land use planning. The Community Development Block Grant (CDBG) Program provides funding from the U.S. Department of Housing and Urban Development (HUD). While typically used for infrastructure improvements in low-moderate income areas, some funds could be used for planning. The Delaware County Office of Housing and Community Development or DCPD should be contacted for more information. The second program, Land Use Planning and Technical Assistance Program (LUPTAP), provides grants and technical assistance, but one of the program's main goals is to promote and encourage the sharing of municipal services, joint planning and zoning, and the application of advanced technology at the local level. The Department of Community and Economic Development (DCED) in Harrisburg or DCPD should be contacted for more information.

No Action

The final option addressing the issues of developing infrastructure to serve growth areas is to do nothing and address each development as it is submitted. This may lead to scattered and patchwork sewage facilities that may lead to great difficulties in the future.

TECHNICAL AND ECONOMIC EVALUATION OF ALTERNATIVES TO ADDRESS THE CONDITION OF EXISTING PUBLIC INFRASTRUCTURE

Correct Inflow and Infiltration Problems

I&I studies should be prepared for older systems in the study area. These studies would identify and prioritize areas where I&I problems are reducing capacity in the systems. Based on the results of the I&I studies, action can be taken to reduce I&I. Reduction of I&I will produce a number of benefits to the authorities and the individual municipalities which include:

- Increased sewer infrastructure capacity for other uses.
- Reduced treatment and operation and maintenance costs associated with treating the I&I flow.
- Reduction or elimination of potential public health hazards resulting from sewage overflows in areas with overtaxed facilities.

Physical corrective actions can include:

- Regular sewer cleaning
- Regular inspection and maintenance
- Manhole inserts
- Roof leader/sump pump disconnects
- Manhole frame repairs
- Slip lining of stream crossings
- Chemical grouting
- Manhole repairs
- Slip lining of other segments
- Inlet disconnects
- Sewer replacement

Public education and implementation of an I&I monitoring program are institutional measures that can also be employed to reduce I&I problems. The previously noted physical corrective actions are listed in approximate order of cost, with sewer replacement being the most expensive. System repairs require lower capital costs than replacing the system. Other advantages associated with correction of identified problems include extended service life of the system and reduced annual conveyance costs, including increased return on investment made to repair the system. One of the foremost advantages to implementing a corrective action plan is that the environment is protected from leakage into the groundwater and from potential contamination of waterways through sewer overflows. Not only is the environment protected, but the overall health and welfare of the public is protected.

The disadvantages to repairing the system include moderate capital costs, some public resistance to the expenditures to repair the system, and temporary public inconvenience while repairing the system. When compared to the high monetary and public health costs and inconvenience associated with failure of the systems, repair costs seem reasonable.

The municipal-specific economics of I&I repair work will need to be developed as part of the study and considered when preparing the corrective action plan. Economic analyses produced as part of the extensive I&I studies conducted in eastern Delaware County clearly indicated a positive return on investment based solely on reduced treatment costs. Additional savings can be garnered through reduced need for additional treatment facilities.

Inspection and Maintenance Programs

Such programs can be particularly beneficial for small-flow sewage treatment facilities, where control is often minimal. Scheduled inspections and maintenance can assure the public that small flow plants do not pose a threat to public health and the environment.

As a disadvantage, the municipality will need to make a financial commitment to conduct these inspections and maintain records. It may be possible to offset the expense of this program by instituting a recurring "registration fee" required for the systems to be inspected.

No Action

Although a prescribed alternative, the no action alternative is not a viable option given the existing and proposed regulatory requirements of DEP and EPA. While doing nothing requires no funding, deteriorating sewage facilities will need to be repaired to meet regulatory commitments. With respect to economics, the no action alternative will be more expensive in the long term because of increased costs of repairs and the more extensive nature of the repairs due to further deterioration.

TECHNICAL AND ECONOMIC EVALUATION OF ALTERNATIVES TO DEVELOP INFRASTRUCTURE TO SERVE GROWTH AREAS

Increase Conveyance and Treatment Capacity at Existing Facilities

Before constructing new treatment facilities, it is usually most economical to maximize the capacity of existing facilities. This would include an I&I elimination program and sewer cleaning program to maximize conveyance capacity. I&I elimination programs typically provide three benefits: reduced treatment costs, extended service life of the collection system, and available treatment capacity at existing facilities. These benefits often exceed the cost of repairs.

Every treatment facility is an assembled collection of individual components or processes. Each of these processes has its own capacity limitation with the most limiting process driving the permit discharge limit. Expansion of existing treatment facilities can often be achieved by adding to the portion of the treatment process that limits the capacity of the facility. This can typically be accomplished at a lower cost than building a new plant. The first step in this process is a capacity evaluation of the facility including an assessment of the structural condition of the treatment processes.

Increase Conveyance and Treatment Capacity with New Facilities

There are a number of advantages to constructing additional capacity. Initially, the construction of additional facilities would improve some of the conditions that contribute to environmental degradation, thus improving public health and welfare.

Newer system components require less repair and maintenance. They also could be sized to eliminate current capacity limitations and provide additional capacity to serve new development.

The disadvantages to constructing additional capacity to serve growth areas include a very high capital cost. With the high cost comes major public resistance to the expenditure and major inconvenience as streets and stream corridors are opened up to either replace or add components parallel to the existing system. Annual operating and maintenance costs will increase as more conveyance and treatment is required. Also, unless all of the lines are replaced with new ones (which would be both cost prohibitive and physically impossible), the old problems and issues associated with the existing aging and leaking sewer lines must still be addressed.

Regional Balancing of Facilities' Capacity

Efficient use of existing or planned facilities is the greatest advantage of a regional balancing approach. Areas in need can gain access to those facilities that have additional capacity to offer. Both parties can benefit financially: areas in need can avoid construction of separate treatment facilities, and capacity providers can charge connection fees, gain revenue from new rate payers, and reduce the per gallon cost of treatment. Benefits to public health and the environment include less discharge into local surface and subsurface waters and more efficient treatment systems than are usually available at larger facilities.

Construction of additional conveyance lines and pump stations needed to transport wastewater to existing treatment facilities is the main disadvantage. Construction activities are expensive and cause significant disruption of traffic. Construction of transmission lines can be less expensive over the life of the project in terms of capital and operating/maintenance expenses than constructing new treatment facilities. Some municipalities are concerned about reduced groundwater recharge if most of the wastewater is taken to a remote facility instead of being discharged locally into the subsurface. Recharging wastewater directly to groundwater can cause other difficulties depending upon the local geology, and any such proposed facility would need a detailed hydrogeologic study to confirm that the area is suitable for the projected flows of the project.

Reuse of Reclaimed Water

Recent years have seen severe drought conditions present in southeastern Pennsylvania. These conditions have resulted in Commonwealth-mandated water conservation measures. While most measures eliminated "quality of life" uses such as watering lawns, washing cars, etc., some neighboring states were contemplating further reductions that would impact industrial users by cutting allowance for manufacturing processing. The reuse of reclaimed water can aid significantly in reducing potable water demand for certain industrial applications, thus minimizing drought impacts.

There are drawbacks to using reclaimed water. Some level of treatment may be required based upon the reuse. For example, it has been documented that gray water can contain considerable amounts of both total coliforms and fecal coliforms. These pathogens can multiply rapidly and can cause serious health risks if not properly handled and treated.

Pennsylvania currently has no specific guidelines or regulations on water reuse, and it handles each application on a case-by-case basis. Many other states and EPA have guidelines that can be followed in developing reclaimed water projects.

No Action

The no action alternative would ignore the fact that the areas with older sewer lines are taking on water and/or potentially leaking to groundwater as well. Doing nothing means that municipalities and conveyance authorities will continue to collect and pay to convey and treat excess water in their sewer systems. Doing nothing may also mean that small treatment facilities and OLDS will continue to be the primary source of wastewater disposal. The management challenges discussed in Chapter 7 would become very important. Existing problems continue to grow and will be more expensive to remediate in the future.

CHAPTER 7

INSTITUTIONAL ALTERNATIVES AND EVALUATIONS

PERFORMANCE OF EXISTING WASTEWATER TREATMENT AUTHORITIES

Chapter 3 lists eight existing wastewater authorities/public entities that provide wastewater treatment to the western planning area. These public organizations are:

- Brookhaven Borough
- CFTSA
- CTSA
- DELCORA
- Rose Valley Borough
- SWDCMA
- Thornbury Township Board of Supervisors
- City of Wilmington, DE

Brookhaven Borough

The Borough of Brookhaven owns and operates a WWTP located at 2 Cambridge Road. Recent upgrades have included a 400,000-gallon tank to control peak flows and a new primary treatment tank. The plant has historically experienced flows in excess of twice its permitted capacity of 0.192 MGD during wet weather events. During 2000, the average annual flow was 0.169 MGD or 88% of permitted capacity, and the 3-month maximum average daily flow was 0.201 MGD, which was greater than permitted. It is clear that the Borough's collection system is experiencing severe I&I that is impacting the ability of the WWTP to meet permit requirements.

Chadds Ford Township Sewer Authority

CFTSA currently owns and operates the Ridings WWTP located at Ridge Road and Ridings Boulevard. In 2000, the plant was operating at approximately 25% of its permitted capacity of 0.08 MGD and is experiencing no operational problems.

Concord Township Sewer Authority

CTSA currently owns and operates the Central STP located at 664 Concord Road. In 2000, the plant's annual average flow was only 32% of its 1.2 MGD permitted capacity, and it has reported no operational problems.

Delaware County Regional Water Quality Control Authority

DELCORA owns and operates the WRTP located in Chester. In 2000, the plant's annual average flow was 71% of its 44 MGD permitted capacity and has reported no

operational problems. Plans are currently underway to request a re-rating of the plant to 50 MGD since process improvements completed in recent years make this flow possible.

Rose Valley Borough

The Borough of Rose Valley currently owns and operates the STP located off of Long Point Lane. In 2000, the plant's annual flow was 58% of its permitted capacity of 0.13 MGD, and its maximum 3-month average was 79% of the permitted capacity. Plans are currently underway to overhaul the plant.

Southwest Delaware County Municipal Authority

SWDCMA owns and operates the Baldwin Run Pollution Control Plant located at Gamble and Park Lanes in Aston. Aston Township, Brookhaven Borough, Chester Township, Chester Heights Borough, Concord Township, Middletown Township, Upper Chichester Township, and Upper Providence Township contribute flow to SWDCMA's plant. In 2000, the plant's annual average flow was 92% of its 6.0 MGD permitted capacity, and its maximum 3-month average was 6.24 MGD, thus exceeding its permit. On October 5, 2001, SWDCMA was notified by DEP that it was to prohibit new connections and was directed to begin planning, design, financing, and construction of measures to meet anticipated demand. SWDCMA submitted a corrective action plan that was approved by DEP in June 2002.

Thornbury Township

Thornbury Township owns and operates the sewage treatment plant located on Thornton Road. In 2000, the plant's annual average was 47% of its 0.12 MGD permitted capacity, and its maximum 3-month average flow was 52% of its permitted capacity. An expansion to 0.18 MGD is currently planned to meet anticipated future demands.

City of Wilmington

The City of Wilmington Department of Public Works owns and operates the Wilmington Water Pollution Control Facility. This facility receives wastewater from Bethel Township. The plant has a capacity of 134 MGD but experiences storm related flows in excess of capacity with a peak flow of 250 MGD reported in 2000. This facility serves an area of Wilmington that has combined sanitary and storm sewers designed to overflow directly to surface waters during precipitation events.

EXISTING LOCAL AGENCY PROGRAM EVALUATION

Feasibility of a Regional Local Agency Program at the Multi-municipal or County Level

Western Delaware County is very diverse in both socioeconomic breakdown and the level of wastewater systems development. While some municipalities located in the

eastern portion of the study area are cooperating in wastewater collection and treatment (DELCORA and SDCA, contributing municipalities of SWDCMA), western municipalities are just now identifying the benefits of such a regional approach. Such regional agreements are developing between Concord and Thornbury and Newtown, Upper Providence, and Edgmont Townships. This regional approach should be encouraged and possibly applied in other municipalities. Cooperation on institutional and technical levels, such as shared SEOs and inspection and maintenance personnel, can be financially beneficial to municipalities and can provide a uniform approach to the management of wastewater disposal systems.

Technical and Administrative Training Needs

SEO training currently occurs on the state level and is fairly uniform. Other technical and administrative personnel involved in sewage facilities management can benefit from similar training programs. Small flow and private plant operators as well as maintenance and inspection personnel should receive standardized training and, possibly, certification. Administrative staff needs help in creating community awareness and public educational programs in line with state requirements.

Joint Municipal Management of Municipal Sewage Programs

Joint municipal management of municipal sewage programs can be beneficial to municipalities, communities, the environment, and public health. Standardized requirements for on-lot and small flow systems should be applied in all municipalities. Joint educational programs can help create public awareness and encourage cooperation. Shared SEOs can be both technically and financially beneficial due to incentives provided by the State. The SEO Reimbursement Program currently covers 50% of the cost for a municipal SEO, while costs for a shared SEO are 85% reimbursed. Uniform training and a standardized program can also increase effectiveness of on-lot and small flow systems inspections and maintenance, particularly if shared crews are used.

ALTERNATIVES TO ADDRESS THE CONDITION OF EXISTING PRIVATE INFRASTRUCTURE

Inspection and Maintenance Programs

Most owners opt to delegate operation and maintenance of private facilities to private companies. Such programs can be particularly beneficial for small-flow sewage treatment facilities where control is often minimal. Scheduled inspections and maintenance can ensure that small flow plants do not pose a threat to public health and the environment.

Public Ownership of Private Treatment Facilities

Public control of private facilities can help to facilitate long-term planning and expansion of service to areas in need of sewage facilities. The Ridings WWTP in Chadds

Ford is an example of public ownership of a treatment plant that was constructed as a private facility. Public ownership, particularly for private systems with significant discharge, can ensure proper operation and maintenance and protect surface waters and public health.

Another advantage of public ownership is increased control over compliance with permit requirements as well as state and federal regulations. Public ownership would also include the annual planning requirements of the Chapter 94 reporting process.

No Action

The final option for addressing the condition of existing wastewater collection, conveyance, and treatment facilities is to do nothing.

ALTERNATIVES FOR PROTECTION OF THE ENVIRONMENT FROM OVERLOADED OR MALFUNCTIONING ON-LOT DISPOSAL FACILITIES

Utilization of OLDS varies greatly across western Delaware County. While some municipalities primarily use centralized sewer collection and treatment systems (Aston, Bethel, Brookhaven, Media, Middletown, Rose Valley, Upper Chichester), others rely heavily on individual or community subsurface disposal (Edgmont, Chester Heights). "Transitional" municipalities plan on continued use of OLDS while developing their wastewater collection and treatment infrastructure in the future (Concord, Thornbury, Newtown, Upper Providence).

OLDS must be installed in compliance with state laws and regulations. *PA Code Chapter 73, Standards for On-lot Sewage Treatment Facilities*, addresses issues ranging from site suitability to mechanical details for various types of OLDS. The SEO, an individual trained and certified by DEP, verifies site suitability tests, inspects installation, and issues permits for new or replacement OLDS. Operation of OLDS is minimally regulated. DEP does not require permitting (with flow limitations or constituent concentration limitations in wastewater discharged into the subsurface) as it does with surface discharge. However, evidence exists that individual and community OLDS can impact on groundwater quality.

While large community subsurface disposal systems are generally well maintained, regular upkeep of individual systems is left to homeowners. As a result, many individual systems are not maintained properly, problems are not detected in a timely manner, and they can become a threat to public health and the environment. None of the municipalities in the study area have ordinances in place requiring septic tank maintenance or inspection at specified intervals. Upper Providence Township currently has a draft of such an ordinance pending approval. Sludge disposal is performed by private parties contracted by individual homeowners. Municipalities do not regulate destinations of this waste or require hauling frequency records. Few municipalities have educational programs regarding OLDS suitability and maintenance.

Mandatory System Requirements

Currently available soil surveys (see Chapter 4, Soils Section) have stated that all Delaware County soils have either moderate or high limitations to on-site wastewater disposal systems use. Installation of new OLDS should be allowed on a case-by-case basis and only after successful soils evaluation and percolation tests are approved by the municipal SEO. Alternative systems should be considered for new or replacement systems in problem areas. Legislatively, municipalities should adopt and strictly enforce ordinances authorizing inspections, requiring maintenance, and prohibiting malfunctioning systems.

Management Programs

A key to consistent and sound OLDS performance is inspection and maintenance. In order to effectively administer a program that addresses all of the OLDS in a municipality, a management program must be developed that requires regular inspections and maintenance and provides public awareness education. These key functions are needed to reduce the potential for threats to public health and the environment from private OLDS in western Delaware County.

The management program can be implemented at the local or intermunicipal level with the program being operated by municipal employees, a service contractor, or a regional authority. Intermunicipal programs are eligible for higher levels of reimbursement from DEP than those that serve single municipalities.

Public Ownership of Community On-Lot Facilities

Municipal ownership of community OLDS can assure the public that these facilities are properly operated and maintained.

No Action

The final option addressing the issues of OLDS is to do nothing.

TECHNICAL AND ECONOMIC EVALUATION OF ALTERNATIVES TO ADDRESS THE CONDITION OF EXISTING PRIVATE INFRASTRUCTURE

Inspection and Maintenance Programs

Such programs can be particularly beneficial for small-flow sewage treatment facilities where control is often minimal. Scheduled inspections and maintenance can assure the public that small flow plants do not pose a threat to public health and the environment.

As a disadvantage, municipalities need to make a financial commitment to conduct these inspections and maintain records. It may be possible to offset the expense