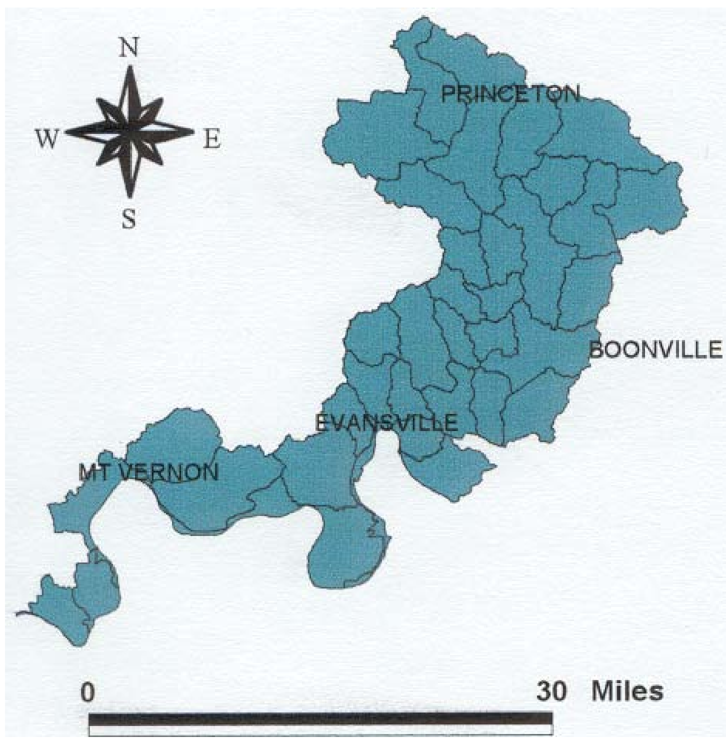
Watershed Management Plan

For

Highland-Pigeon Watershed



Appendix C: Summary of Combined Sewer Overflow Effects

Combined sewer overflow (CSO) Monitoring

Rainfall and CSO events were monitored between January 2000 and September 2000. Rainfall events were monitored using an existing rain gauge at CSO No. 025 (Diamond Avenue). The frequency and magnitude of CSO events was monitored using existing measurement equipment at three CSO outfalls, deemed representative of the system. Based upon the characteristics of all permitted CSO outfalls to Pigeon Creek three CSOs were selected for monitoring (Harza 1999):

- CSO No. 025 – Diamond
- CSO No. 011 - Oakhill/Weinbach
- CSO No. 012 – Maryland

ADS Environmental Services, Inc. of Indianapolis provided installation and maintenance services for CSS monitoring equipment. It was intended to use their automatic recording ultrasonic velocity meters and pressure transducers to compute overflow hydrographs. However, quality control questions about data reliability precluded the use of this data. Instead, data from the existing "totalizers" at each outfall were used. These compute daily flow volumes based on hydraulic head and gate opening at each CSO.

Automatic samplers were installed and operated to monitor CSO discharge quality. The automated samplers were installed at CSO Nos. 025 and 011, Diamond and Oakhill. Sampling was initiated manually, with samples taken at 15-minute intervals for two hours, followed by sampling at 30-minute intervals for two hours. Generally, 12 samples were collected over a four-hour period for each monitored wet weather discharge event. This sampling was paired with manual sampling of Pigeon Creek at five locations during the event. Details on sampling and analytical methods may be found in the QAPP (Harza 1999).

Frequency and Magnitude of Combined Sewer Overflows

During the 8-month monitoring period, cumulative overflow volumes were recorded by the totalizers at CSO Nos. 025, 012, and 011 (Diamond, Maryland, and Oakhill respectively) through the gate just downstream of the diversion point (throttle pipe) to the wastewater treatment plant and the overflow control structure. The volumes measured therefore represented the total overflow and do not include flows to the treatment plant.

Frequency and magnitude of overflows were evaluated based on data collected between January 18, 2000 and August 15, 2000. During this 211-day time period, there was a complete record of overflows for all three locations. EMC staff routinely visit each CSO station daily, except for weekends and holidays, and record the totalizer readings. There were 13 CSO events at Oakhill, 37 events at Maryland, and 28 at Diamond during the 211-day period. There were approximately two CSOs per month at Oakhill, five per month at Maryland and about four per month at Diamond. CSO volumes were generally three times greater at Maryland than at Oakhill and twice the CSO volumes at Diamond. The average CSO at Maryland was 43 million gallons, compared to 14 million at Oakhill and 21 million at Diamond.

OVERFLOW EVENTS AT OAKHILL	
Date	**Volume (MG)**
02/14/00	7.53
02/22/00	41.60
02/24/00	0.18
02/28/00	12.30
03/16/00	1.41
03/17/00	13.42
03/20/00	1.43
04/10/00	3.95
07/03/00	0.03
07/12/00	78.57
07/19/00	16.51
07/31/00	0.04
08/28/00	3.03

OVERFLOW EVENTS AT MARYLAND Date Volume (MG)	
01/18/00	5.15
02/14/00	26.27
02/18/00	37.57
02/22/00	753.96
02/24/00	202.00
02/28/00	121.63
03/13/00	2.51
03/16/00	29.96
03/17/00	19.28
03/20/00	64.81
03/21/00	1.11
03/27/00	2.95
04/10/00	62.75
04/28/00	2.01
05/08/00	0.80
05/10/00	0.73
05/15/00	0.30
05/19/00	6.12
05/24/00	4.32
05/30/00	8.92
06/05/00	0.32
06/06/00	0.38
06/15/00	6.26
06/19/00	110.23
06/21/00	12.86
06/26/00	14.56
06/27/00	8.56
06/28/00	1.94
07/03/00	1.86
07/05/00	5.02
07/12/00	0.58
07/19/00	11.76

OVERFLOW EVENTS AT MARYLAND Date	Continued Volume (MG)
07/31/00	6.10
08/08/00	3.18
08/09/00	1.22
08/24/00	11.89
08/28/00	25.11

OVERFLOW EVENTS AT DIAMOND	
Date	**Volume (MG)**
01/18/00	6.12
02/14/00	20.56
02/18/00	62.21
02/22/00	224.44
02/24/00	47.57
02/28/00	47.55
03/16/00	14.62
03/17/00	15.67
03/24/00	1.00
03/27/00	1.95
04/10/00	20.25
05/19/00	3.67
05/24/00	11.78
05/30/00	4.33
06/19/00	37.70
06/21/00	8.42
06/22/00	3.94
06/26/00	3.27
06/27/00	12.01
06/28/00	1.73
07/05/00	3.16
07/12/00	3.54
07/19/00	6.69
07/31/00	4.37

OVERFLOW EVENTS AT DIAMOND	continued
08/09/00	4.32
08/24/00	9.27
08/28/00	12.06

Water Quality Effects

Automated samplers at the Maryland and Diamond CSOs took samples during select events between February and August 2000. Combined sewage samples were analyzed for suspended solids, BOD, *E. coli*, phosphorus, total Kjeldahl nitrogen (TKN), ammonia nitrogen, arsenic, zinc, chromium, copper, lead, cadmium and nickel. Typically, twelve samples were collected at each CSO during an overflow event. During the monitoring period, concurrent surface water samples were also taken. Creek samples were collected manually at five locations once during each sampling events. Creek samples were taken from PC7, upstream of all CSOs, PC4, PC3, PC2 and Highway 62.

To assess the impacts of the CSOs to water quality, we compared the sampling results to Indiana surface water standards. The exceedances of standards were limited to *E. coli* bacteria (Table 39). The Indiana standard for E. coli is a recreational standard and a maximum at 235, measured as bacteria per 100 mL. Four out of the five storm events we sampled surpassed the *E. coli* limit. Sampling station PC7 is upstream of CSOs and reflects nonpoint and point source coliform loadings from the upper watershed. Note that these upstream sources also cause the creek to exceed the state water quality standard. PC4 is downstream of Oakhill CSO and upstream of all other CSOs, including Diamond and Maryland. PC3 is downstream of two more CSOs, including Diamond Avenue. PC2 is located upstream of Dresden CSO (014) as well as Maryland, and downstream of 6th Avenue (CSO 017). The sample at US Highway 62 is near the Ohio River, below all Pigeon Creek CSOs.

***E. COLI* CONCENTRATIONS DURING STORM EVENTS**					
Storm Event	**PC7**	**PC4**	**PC3**	**PC2**	**Hwy 62**
02/13/00	No creek samples collected				
03/16/00	3,100	10	45,000	10,000	23,000
05/23/00	55	15	25	8	28
06/21/00	270	370	1,140	1,710	640
08/08/00	570	510	580	360	240
08/18/00	3,500	27,000	39,900	50,000	17,100

Concentrations are plotted against distance from the mouth of the Ohio River. As points of reference, the locations of various CSOs and the Little Pigeon and Locust Creeks are also included.

Phosphorus. Based on the data collected, phosphorus concentrations are relatively constant at all points along Pigeon Creek in the CSO impact area. We generally did not observe more than a 0.3 mg/L fluctuation between sampling points during any given storm event. In all monitored events, there was either no change or a decrease in phosphorus concentrations upstream of the CSOs, as represented by the PC7 sample, or downstream past the Oakhill outfall to PC4. It would therefore appear that the Oakhill CSO has a minor contribution to the watershed's overall phosphorus budget. Downstream of PC4, the Diamond (CSO 025) and Baker (CSO 024) outfalls discharge, contributing pollutants that would have been measured at the PC3 sampling location. In three of the five events, significant increases in phosphorus concentrations were observed at PC3. Typically concentrations were relatively stable or decreased downstream of PC3, at PC2, PC1, and through the final monitoring location at US Highway 62, below all Pigeon Creek CSOs. The state does not have a water quality standard for phosphorus, although nutrient criteria may be developed in the next five years.

BOD. With the exception of the May 23, 2000 event, BOD in Pigeon Creek during wet weather was relatively unaffected by the CSO loads. The March 16, 2000 storm event data indicate a dramatic increase between the BOD concentrations at the PC4 and PC7 sampling points. We believe the BOD analysis of the PC7 sample is not representative of instream water quality and may be due to sampling or measurement error. The general BOD trend seems to be one of minor contributions from Evansville's CSOs.

Suspended Solids. While there is substantial noise in the data, the suspended solids concentrations along the waterway seem to be unaffected by the CSO inflows. We attribute this noise to the lack of flow-weighted sampling and incomplete mixing downstream of CSOs discharges. During all monitored storm events, TSS levels are high throughout the creek reach we studied, including PC7, upstream of the CSOs. The data do not provide clear evidence for an adverse effect of Evansville's CSOs.

Maryland and Diamond CSO subsystems serve areas considered to be at different levels of risk for soil erosion. Diamond subsystem has a high rating for soil erosion and potential solids and floatables impacts, but Maryland has a low potential for soil erosion (but high potential for potential solids and floatables impacts). Peak concentrations in the combined sewage of the two CSOs were similar, although Maryland's was typically slightly higher than that found in Diamond Avenue sewage.

***E. coli*.** As discussed earlier, the *E. coli* concentrations (measured per 100 mL) are consistently high during all except the May 23, 2000 storm event and over the entire distance of the creek. There is often an increase in *E. coli* concentrations going from the first data point at PC7 to PC4. This increase occurs in two out of the five storm events. In addition, aside from some variation, the general trend downstream is for the *E. coli* concentration to increase. Even when there are decreases within the data, the *E. coli* levels are higher than the recreational water quality standard. There is a frequent increase from PC4 downstream to PC3 in *E. coli* concentration, suggesting that the Baker Street (CSO 024) and/or Diamond Avenue (CSO 025) have compounding effects on receiving water quality.

Historically, concentrations of *E. coli* in Pigeon Creek have commonly exceeded the state's standard, both upstream and downstream of the CSO area of influence. There are point and/or nonpoint sources of coliforms upstream of Evansville that contaminate the stream, confirmed by watershed sampling.

Ammonia Nitrogen. Creek concentrations reach no more than 4 mg/L in any storm event. Instream temperature and pH measurements were not taken, so the concentration of ammonium ion cannot be estimated properly. Ammonia nitrogen concentrations generally decrease over the stretch of the sampling area.

Total Kjeldahl Nitrogen (TKN). The TKN data also contain a considerable amount of noise. Because of this, it is difficult to draw conclusions regarding the impact of the CSOs on TKN. In four out of five events, increases in TKN concentration were observed downstream of PC7, but, by Hwy 62, may return to the levels found upstream (at PC7).

Nitrate Nitrogen. Nitrate concentrations exhibit less fluctuation along the CSO-affected stretch of the creek. The largest change in concentration from one sampling point to the next was 0.8 mg/L, with the other fluctuations being well below that. We conclude that the nitrate loads from the CSOs and streams do not significantly affect the instream nitrate concentrations.

Metals. The Maryland CSO subsystem serves an area of moderate residential population, moderate industrial development, with a low risk of a hazardous material spill. Diamond CSO subsystem serves an area of relatively moderate residential population, relatively high industrial development, with a high risk of a hazardous material spill. We monitored several heavy metals in the two CSOs. Arsenic concentrations were similar in Diamond and Maryland discharges. In no cases was arsenic in the CSO discharge measured to exceed acute aquatic criteria in 327 IAC 2-1-6, assuming 100 mg $CaCO_3$/L hardness.

Maximum zinc concentrations were 0.5 mg/L in each of the two monitored CSOs . Again, assuming 100 mg/L hardness, we observed two samples to exceed the zinc acute aquatic criteria in 312 IAC 2-1-6.

In four of five discharge events, maximum chromium and copper concentrations in Maryland were higher than Diamond. Chromium in the CSO discharge was not measured to exceed the State's acute aquatic standards in either outfall, however copper values did in both.

For lead, Diamond CSO exhibited higher concentrations than Maryland, and exceeded the acute aquatic criteria. Maryland discharge was not measured to exceed the lead acute aquatic criteria. Nickel concentrations were similar in the two discharges, and were well below the criteria.

5.4 MUNICIPALITIES, SENSITIVE AREAS AND RECREATIONAL FACILITIES

Federal and state CSO policies require that the highest priorities be given to controlling overflows to waterways in sensitive areas. Therefore, as part of developing the long-term control plan, the EWSU is expected to identify all sensitive waterbodies and the CSO outfalls that discharge to them. Sensitive areas have been defined by the US EPA as:

- National Marine Sanctuaries
- Outstanding National
- Resource Waters
- Waters with threatened or endangered species or their designated critical habitats
- Primary contact recreation waters, such as bathing beaches,
- Public drinking water intakes or their designated protection areas, and,
- Shellfish beds

The State of Indiana only recently defined outstanding national resource waters (SEA, Section 17, adds IC 13-18-3-2(d) effective July 1, 2000) and none are yet designated in the study area or Ohio River. There are also no national marine sanctuaries in the study area. The only recording of a state or federally listed species occurring in the Pigeon Creek floodplain downstream of the Oakhill discharge (CSO #011) is the hellbender, a giant aquatic salamander. Hellbender is a state-listed endangered species. Hellbenders prefer clear fast-flowing streams and rivers with rocky bottoms (Behler and King 1998). They are reclusive, hiding under rocks, feeding on macroinvertebrates. Pigeon Creek in Evansville is generally sluggish and turbid with a silt, sand or gravel bottom. There is no date in DNR's database for the last sighting of hellbenders in Evansville. Even with elimination of CSO discharges, Pigeon Creek will remain sluggish and turbid due to its low gradient, backwater effects of the Ohio River, and nonpoint pollution sources of siltation from upstream areas.

There are no primary contact recreation waters in that portion of Pigeon Creek within the CSO area of influence. Heidelbach canoe launch is located on Pigeon Creek approximately two miles downstream of the Oakhill discharge (CSO #011). Canoeing is secondary contact recreation, and would not be expected to occur during or shortly after a storm event. Also the Pigeon Creek Greenway starts at the Heidelbach canoe launch and continues downstream to the Ohio River. The Greenway trail is separated from Pigeon Creek by a minimum 50 to 100-foot wide forest or prairie buffer and steep muddy banks. Similarly the Greenway is not typically used during or shortly after storms, and, the muddy banks and forest buffer provide a barrier discouraging contact with the creek. The entire reach of Pigeon Creek affected by CSO discharges is signed by EWSU to caution users against contact recreation after wet weather.

There are no public water intakes in the Pigeon Creek CSO area. The City of Evansville's intake is in the Ohio River, upstream of Pigeon Creek, north of Sunset Park.

Pigeon Creek harbors freshwater mussels. There are no shellfish beds that are harvested for food there, which is EPA's general regulatory focus. Freshwater mussels are threatened nationally due to water quality and habitat degradation. The CSOs are an example of water quality degradation, but no threatened or endangered species of mussels are recorded for this area.

Seveal locations along Pigeon Creek that may fit IDEM's "priority area" designation are the Hiedelbach Canoe Launch, Kleymeyer Park, Garvin Park, and Nut Club Field. These areas should be given priority attention in the city's long-term CSO control plan.

CONCLUSIONS AND RECOMMENDATIONS

The data collected as part of this study has served to confirm that there are frequent combined sewage overflows from the Evansville sewer system. There is very little baseline data available on Evansville's CSOs. It is therefore difficult to quantify what decrease in frequency and magnitude of CSO discharges have occurred by implementation of the nine minimum controls. The seven automated control structures constructed in 1980 and upgraded in 1990 undoubtedly reduce the frequency and volume of discharges from the largest Pigeon Creek CSOs. Many collection system and treatment plant projects in recent years have also helped reduce overflows. Sewer separation and inflow and infiltration projects planned and in-progress are helping lessen CSO loadings. Forthcoming Phase II Storm Water Regulations will also eventually aid in CSO reduction. Environmental education efforts will also expand as the LTCP elements are completed.

This report recommends several courses of action be taken to directly and indirectly reduce CSO discharges to Pigeon Creek. Those recommendations include development of a monitoring and modeling plan, continued sewer separation, increasing primary treatment at the wastewater plants (when approved by the IDEM), continued inflow and infiltration reduction efforts, inline storage projects, and a runoff control program. The LTCP, which has been initiated, will consider the feasibility of these and additional technology-based CSO controls.

Evansville, as all other CSO municipalities in Indiana, will be required to develop a technically feasible, affordable, and comprehensive LTCP consistent with the CSO Control Policy. That Policy is intended to document how and when a community will meet the Clean Water Act requirements. The two main methods to demonstrate compliance were the Demonstration and the Presumption Approaches.

The Presumption Approach requires that the LTCP implementation will result in:

- No more than an average of four overflow events a year
- The elimination or capture of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis
- The elimination or removal of no less than the mass of the pollutants identified as causing water quality impairment through the sewer system characterization, monitoring, and modeling effort for the volumes that would be eliminated or captured for treatment

Computer modeling during the LTCP will estimate the reduction in overflow volume that the seven automated structures have created since their construction. However, it is unlikely that the Presumption Approach will suffice on Pigeon Creek due to the criteria of no more than an average of four overflow events yearly. The Demonstration Approach requires successfully demonstrating compliance with the following criteria:

- The planned control program is adequate to meet water quality standards and protect designated uses, unless standards or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs
- The CSO discharges remaining after implementation of the planned control program will not preclude attainment of water quality standards or the receiving waters designated uses or contribute to their impairment
- The planned control plan will provide the maximum pollution reduction benefits reasonably attainable, and
- The planned control program is designed to allow cost-effective expansion or cost-effective retrofitting if additional controls become necessary to meet standards or designated uses

Consequently, as part of this study, we have attempted to indicate if Evansville can demonstrate that it meets the water quality based objectives of the Clean Water Act through use of the Demonstration Approach.

In addition to these two approaches to CSO control, the State of Indiana is presently developing guidance for the creation of CSO controls that are practical and cost-effective. Senate enrolled Act 431, signed into law on March 17, 2000, requires the IDEM to develop guidance for Combined Sewer municipalities on how to comply with the Act. More specifically, the guidance will detail the process and procedures with which municipalities must comply in order to develop and submit a LTCP and an Use Attainability Analysis that may be approved by IDEM and the EPA.

The provisions of SEA 431 authorize the temporary suspension of designated uses and associated water quality criteria, provided certain requirements are met. An Use Attainability Analysis (UAA) is a structured scientific assessment of the physical, chemical, biological, and economic factors affecting the attainment of a designated use as defined in 40CFR 131.3(g). The UAA provides a process by which a CSO community may demonstrate that a designated use is not attainable and may obtain a temporary suspension of that designated use. Much of the information required in the UAA is the same as what is required in the LTCP; therefore, IDEM will use the approved LTCP as much as possible to satisfy the requirements of the UAA.

It should be noted that the guidance for these requirements is presently being created. The eventual outcome should be a more realistic approach to CSO controls. Evansville’s LTCP and UAA will determine exactly which route best serves both pollution prevention and fiscal responsibility.

As a component of this Pigeon Creek Watershed Diagnostic Study, the SRCER for Pigeon Creek is included. The broad scope of this watershed analysis actually includes more information than required by the SRCER. The data acquired for the chemical, physical, and biological health of the watershed should benefit all parties involved. Evansville will probably find that a combination of the Demonstration Approach and the provisions of SEA 431 will be the best method of CSO reduction.

From the available water quality data, we can confirm that Pigeon Creek is affected by CSO discharges of *E. coli* bacteria and that this water quality standard is regularly exceeded during wet weather. No other water quality standards, as monitored as part of this study, are conclusively and adversely impacted by the CSOs.

Historic concentrations of *E. coli* in Pigeon Creek have commonly exceeded the state's standard, both upstream and downstream of the CSO area of influence. There are point and/or nonpoint sources of coliforms upstream of Evansville that contaminate the stream, confirmed by our sampling.

Despite this relatively minor impact of CSO's discharges to water quality in Pigeon Creek, there are still a number of measures that EWSU should continue to optimize the operation of the sewer system and further reduce CSO's and their adverse impacts on water quality in Pigeon Creek. Recommended measures are as follows:

Monitoring and Modeling Plan
EWSU should continue development of a Monitoring and Modeling Plan as part of the LTCP for the sewer system. This will assist the Utility in developing a full understanding of the sewer system, its response to various precipitation events, and the characteristics of the overflows. The monitoring program will also serve to confirm the findings of this study and help establish the effectiveness of the CSO controls implemented to date.

Using the model, hydraulic restrictions in the system could be eliminated if flow monitoring work verifies modeling parameters. Specifically, restrictions in throttle pipes at CSOs 009, 012, 016 and 025, which may be at or near their capacity, should be investigated. If upsizing of throttle pipes is warranted, further study of capacity remaining in the Pigeon Creek Interceptor may be necessary.

Continued Sewer Separation
EWSU currently operates both separate sanitary and combined sewers in the various subsystems. However, in a number of cases, separate sanitary sewers discharge to downstream combined sewers for conveyance of the wastewater to the two treatment plants. For example, the Pfeiffer pump station discharges sanitary sewage for Basin W10 into the 102" CS in Basin W6. This discharge is upstream of Diamond CSO (025) on the 102" line. Consequently, during precipitation events, this sanitary sewage is contributing to the overflows or may in fact be the cause of the overflow.

The recommendation now is for EWSU to review options for keeping the sanitary sewage separate from the combined sewers. This can be done by installing a separate sanitary interceptor line that terminates at one of the two wastewater treatment plants. This objective may also be achieved by investigating measures that will allow sanitary sewage to be given priority for discharge into the existing combined sewer interceptors, such as the Pigeon Creek Interceptor. The objective of either of these approaches will be to remove separate sanitary sewage from combined sewage overflows, thus changing the characteristics of such overflows and improving water quality.

It is our understanding that a third treatment plant has been proposed for Evansville and that, thus far, much of the separately sewered areas will be diverted to this new plant. A decision to proceed in this manner will be fully compatible with this approach and will achieve the objective of keeping separate sewage out of the combined sewers.

Treatment Plant Operation
EWSU should approach IDEM with a request for utilizing the existing unused primary treatment capacity at the treatment plants during wet weather. This will allow EWSU to capture and treat a greater percentage of the flows and reduce overflows of untreated combined sewage.

In order to implement such actions, EWSU must also review the capacity of its conveyance system to the plants, and determine whether there is sufficient sewer capacity to deliver the larger flows to the WWTPs. If not, EWSU must review options for increasing sewer capacity to be able to maximize primary treatment at the plants.

Inflow and Infiltration Reductions
It is recommended that all commercial and industrial structures be inspected to identify all sources of inflow and infiltration to the sewer system. Efforts should be made to disconnect such direct sources of inflow, such as downspouts, as much as possible.

The inflow/infiltration monitoring program should be expanded in the combined sewer system. As problems are identified, they should be corrected.

Inline Storage
A gate control system, which would control the non-automated CSOs to Pigeon Creek and the Ohio River, would allow the storage of combined sewerage in the interceptors tributary to the diversions. This gate control system could provide about 154,5000 cubic feet (11.6 MG) of storage. To obtain the full amount of storage, available, additional weirs, gates, etc. may be necessary. A study to investigate the feasibility of such a system, and the condition of the sewers at the storage sites (to avoid damage from surcharging) is warranted. This option will be further investigated during development of the LTCP.

Runoff Control Program
Evaluation of a runoff control program to store and control runoff before it enters the combined system is also recommended. The feasibility and effectiveness of this alternative and others requires development of a system model, scheduled for completion as part of the LTCP.

LTCP
EWSU has retained a consultant to develop a long-term CSO control plan (LTCP) for their sewer service area. The LTCP will include the following elements:

1. The LTCP must be consistent with the federal CSO Policy (58 Fed. Reg. 18688). The LTCP must be approved by the IDEM and ultimately implemented by the CSO community according to a schedule determined by the IDEM.
2. The LTCP must be developed with public participation, using a process designed to promote active involvement by the affected public.
3. The LTCP must use characterization, monitoring and modeling of the combined sewer system to determine:
    a. the response of the combined sewer system to various precipitation events;
    b. the characteristics of the overflows from the combined sewer system (volume and pollutants), and
    c. the water quality impacts that result from the overflows
4. The LTCP must contain an evaluation of a reasonable range of control alternatives, taking into account expected and projected future growth.
5. The LTCP must consider the impact of CSOs on sensitive areas and give highest priority to controlling overflows in those areas.
6. The LTCP must contain cost and performance analysis of the control alternatives evaluated.
7. The LTCP must maximize treatment of wet weather flows at the treatment plant.
8. The LTCP must contain a practical implementation schedule for the selected control alternative.
9. The LTCP must contain a post-construction compliance monitoring program adequate to ascertain:
    a. the effectiveness of the selected control alternative; and
    b. the extent to which water quality standards have been attained.