



INFRASTRUCTURE SOLUTION SERVICES

February 15, 2021

Mr. Scott Morgan
City Manager
City of West Melbourne
2240 Minton Road
West Melbourne, FL 32904

RE: SEPTIC-TO-SEWER MASTER PLANNING STUDY
CITY OF WEST MELBOURNE

Mr. Morgan,

Infrastructure Solution Services, LLC (“ISS”) was tasked by the City of West Melbourne to develop a Septic-to-Sewer Master Planning Study to evaluate potential septic-to-sewer projects within the City and to analyze the feasibility and eligibility of obtaining Save Our Indian River Lagoon (SOIRL) funding for these potential projects. This Technical Letter presents our draft findings.

Central to this evaluation is the utilization of funding through Brevard County’s Save Our Indian River Lagoon (SOIRL) program. SOIRL funding for septic-to-sewer conversions is based on pounds of total nitrogen removed per year and is currently set at a potential maximum project funding of \$1,500 per pound of total nitrogen removed. This septic-to-sewer study includes the review and analysis of septic system nutrient loading data, conceptual design of potential sanitary sewer service areas, estimate of potential SOIRL funding for the service areas, conceptual cost estimates to construct each sanitary sewer service areas, rankings of potential service areas based on cost effectiveness, and recommendations for further study.

Purpose

The purpose of this study is to evaluate the feasibility of converting existing residential septic systems to the City of West Melbourne’s sanitary sewer system and to analyze the feasibility/eligibility of obtaining SOIRL funding for these potential projects. The approach taken by ISS to develop this study followed the steps shown below:

- a. ISS obtained Brevard County modeling results of nutrient loadings from septic systems in the City of West Melbourne to surface water flowing to the Indian River Lagoon (IRL).
- b. Using SOIRL criteria, ISS estimated the potential funding available to provide sewer service to the affected areas in the City of West Melbourne.
- c. Conceptual level plans for providing sewer service were developed for each service area deemed feasible to include sanitary system locations, potential lift station locations, force main tie-in locations, and other information as appropriate.

- d. Conceptual cost estimates for the proposed improvements within each service area were prepared.
- e. The areas that could potentially be moved from septic-to-sewer and funded by SOIRL were ranked to show the most cost-effective areas.

Summary

ISS reviewed all available information, studied aerial imagery of prospective service areas, and spoke with Brevard County government personnel to receive clarifications on a number of questions related to the SOIRL GIS maps and current funding criteria. ISS looked at seven (7) specific service areas that showed the most potential (Figure 1) and then developed conceptual designs for converting the homes within each service area from septic systems to a new sewer collection system. These conceptual designs were based on existing site conditions, typical engineering methods, and considerations of the amounts of potential SOIRL funding available for the project. Cost estimates were developed for each service area and the areas were then ranked based on area project cost offset by the amount of SOIRL funding available for each area. Each service area was analyzed as an independent project area and the costs assigned to each area reflect those costs to make that area fully functional. Cost efficiencies could be obtained by combining areas and possibly eliminating a lift station or segments of force main. Also of note is the existence of county properties in close proximity to City of West Melbourne residences. Additional funding assistance could possibly be garnered through cost sharing with Brevard County for those properties. A table showing the cost effectiveness of converting from septic-to-sewer for all areas analyzed is shown in Table 5.



Figure 1 – Service Areas

Review and Analysis of Data

ISS requested and obtained GIS-based nutrient loading data for septic systems from Brevard County’s SOIRL

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program. The most recent SOIRL GIS data, noted as version 17, was used as the basis for this study; however, SOIRL program personnel indicated that updated nutrient loading GIS data may become available in several months and therefore, updated evaluation for any areas being pursued may be warranted at that time. The current nutrient loading data was reviewed and analyzed using ArcGIS Pro along with Brevard County 2020 aerial imagery. Concentrated nutrient loadings from residential septic systems were identified in the areas surrounding Sylvan Drive due to the proximity of the septic systems to existing canals which ultimately discharge to the Indian River Lagoon. The analysis results include nutrient loading within potential services areas generally located west, north and east of the recently constructed Sylvan Drive septic-to-sewer project. **See Attachment A for the GIS-delineated service areas.** Seven separate service areas including 276 residential septic systems have been delineated for funding and conceptual cost consideration. Table 1 provides a summary of the services areas and associated nutrient loading based on SOIRL GIS data.

Table 1
Service Areas and Nutrient Loading

Service Areas¹	Septic Systems (residential parcels)	Nutrient Loading (lbs. TN per year)
SA_SS_01	34	479
SA_SS_02	61	1,182
SA_SS_03	60	1,449
SA_SS_04	16	245
SA_SS_05	46	1,136
SA_SS_06	44	769
SA_SS_07	15	331
TOTALS	276	5,591

¹ SA_SS_04 includes three Brevard County parcels and SA_SS_06 includes eighteen Brevard County parcels.

Conceptual Design

Sanitary sewer conceptual designs have been prepared in GIS for each service area. The conceptual designs include manholes, gravity pipes, lift stations, and force mains. For the purpose of this study, each service area has been designed to independently connect to the City's existing sanitary sewer system; however, cost and system efficiencies may be realized in the event services areas share common system elements including lift stations and force mains. **Refer to Attachment A for service area figures for layouts of each service area conceptual design.** Table 2 summarizes the quantities of manholes, gravity pipes, lift stations, and force mains for each service area. Note that service area SA_SS_07 includes fifteen septic systems directly north of Sylvan drive along the south right-of-way of Sheridan Avenue. Construction of this segment of sewer will most likely require acquisition of permanent easements in some front yards. Based on the conceptual design, Service Area SA_SS_07 is the only service area that does not require a lift station and force main due to its proximity to the recently constructed Sylvan Drive sanitary sewer system. Additionally, it should be noted that service areas SA_SS_04 and SS_SA_06 include septic systems that are located within Brevard County residential parcels, three and eighteen septic systems respectively.

**Table 2
 Conceptual Design**

Service Areas	Manholes	Gravity Pipe (LF)	Lift Stations	Forcemain Pipe (LF)
SA_SS_01	9	2,286	1	642
SA_SS_02	32	4,945	1	512
SA_SS_03	16	4,026	1	270
SA_SS_04	7	1,775	1	334
SA_SS_05	16	2,972	1	2,549
SA_SS_06	18	4,785	1	998
SA_SS_07	4	1,654	0	0
TOTALS	102	22,443	6	5,305

SOIRL Project Funding

Brevard County’s SOIRL provided ISS with the most recent nutrient loading values in GIS data format, denoted as version 17 within the GIS metadata. Please note that SOIRL program personnel indicated that updated nutrient loading GIS data may become available in several months and therefore, further SOIRL project funding analysis may be warranted at that time. Nutrient loading values, lbs. of total nitrogen per year, have been reviewed in GIS for the parcels within each service area. See the attached service area figures for SOIRL nutrient loading for each service area septic system parcel. The SOIRL nutrient loading data has been categorized and shown on the figures according into five numerical ranges for ease of visual comparison. The SOIRL program website, <https://www.brevardfl.gov/SaveOurLagoon/grants/ProjectSelection>, provides funding rates in the form of grants for various nutrient removal projects. The applicable SOIRL nutrient removal category for this study is denoted as “Septic System Removal by Sewer Extension”. For septic system removal and conversion to sanitary sewer via extension, the SOIRL program website indicates a maximum potential funding rate of 1,500 per lbs. total nitrogen per year. Table 3 summarizes the nutrient loading data and the maximum potential SOIRL funding.

**Table 3
 SOIRL Project Funding**

Service Areas	Nutrient Loading (lbs. TN per year)	SOIRL Funding ¹
SA_SS_01	479	\$718,500
SA_SS_02	1,182	\$1,773,000
SA_SS_03	1,449	\$2,173,500
SA_SS_04	245	\$367,500
SA_SS_05	1,136	\$1,704,000
SA_SS_06	769	\$1,153,500
SA_SS_07	331	\$496,500
TOTALS	5,591	\$8,386,500

¹ SOIRL funding based on \$1,500 per lbs. of total nitrogen, TN, removed per year.

Conceptual Cost Estimates

Sanitary sewer conceptual cost estimates have been prepared for each service area. The estimates are based on costs derived from the recently constructed Sylvan Drive septic-to-sewer project. The unit costs from the Sylvan drive project bids were averaged, increased for recent cost adjustments, and then applied to the potential service areas according to the quantity of septic system to be converted to sanitary sewer and quantities of system components. Table 4 provides a summary of the conceptual cost estimates, the detailed estimates are attached for reference. The service area project costs range from approximately \$930,000 to \$4,161,000 in general accordance with the number of septic systems to be converted to sanitary sewer. Each service area has been considered separately; however, cost efficiencies may be realized in the event services area share common system components including lift stations and force mains.

**Table 4
Conceptual Cost Estimates**

Service Areas	Septic Systems (residential parcels)	Conceptual Costs
SA_SS_01	34	\$2,353,400
SA_SS_02	61	\$4,161,700
SA_SS_03	60	\$3,711,300
SA_SS_04	16	\$1,546,250
SA_SS_05	46	\$3,155,300
SA_SS_06	44	\$3,336,650
SA_SS_07	15	\$930,750
TOTALS	276	\$19,195,350

Project Rankings and Recommendations

Cost effectiveness for each service area was considered based on the ratio of potential SOIRL maximum funding to the respective conceptual cost estimates. The funding-to-cost ratios range from 0.24 to 0.59 with an overall average ratio of 0.44. Each service area has been ranked in order according the funding cost ratios. Additionally, the rankings have been assigned a qualitative cost effectiveness ranking (high, mid, low) for each service area. Table 5 provides a summary of the cost effectiveness ratios and service area rankings. ISS recommends further consideration of the project service areas assigned with a “high” cost effectiveness ranking. As noted previously, additional cost efficiencies may be realized in the event system components are shared between selected service areas.

Table 5
Cost Effectiveness Service Area Rankings

Service Areas	SOIRL Funding	Conceptual Costs	Funding to Cost Ratios	Cost Effectiveness Project Rankings
SA_SS_01	\$718,500	\$2,353,400	0.31	6 th (low)
SA_SS_02	\$1,773,000	\$4,161,700	0.43	4 th (mid)
SA_SS_03	\$2,173,500	\$3,711,300	0.59	1 st (high)
SA_SS_04	\$367,500	\$1,546,250	0.24	7 th (low)
SA_SS_05	\$1,704,000	\$3,155,300	0.54	2 nd (mid)
SA_SS_06	\$1,153,500	\$3,336,650	0.35	5 th (low)
SA_SS_07	\$496,500	\$930,750	0.53	3 rd (mid)
TOTALS	\$8,386,500	\$19,195,350	0.44	

Sincerely,



Thomas Vill
INFRASTRUCTURE SOLUTION SERVICES

Attachments:
GIS Service Area Figures
Conceptual Cost Estimates

Copy: ISS File