JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
STATE WORKING GROUP FOR CLEANING UP, CONSERVATION AND DEVELOPMENT FOR THE HAVANA BAY (GTE)
THE REPUBLIC OF CUBA

THE DEVELOPMENT STUDY ON THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY IN THE REPUBLIC OF CUBA

FINAL REPORT
VOLUME III SUPPORTING REPORT

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NIHON SUIDO CONSULTANTS CO., LTD.

THE DEVELOPMENT STUDY ON THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY IN THE REPUBLIC OF CUBA

VOLUME III SUPPORTING REPORT

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ABBREVIATION

B/C	=	Benefit Cost Ratio
CAP	=	Provincial Administrative Council
CAR	=	Cartagena convention
CECM	=	Executive Committee of the Council of Ministers
CENHICA	=	National Center for Hydrology and Water Quality
CIMAB	=	Cuba's Center for Engineering and Environmetal Management of Bays and Coastal Zones
CITMA	=	Delegation of the Ministry for Science, Technology and the Environment in Havana City
DISM	=	Directorate of Marine Security and Protection
DPRH/Havana-City	=	Provincial Delegation of Resources of Havana City of the National Institute for Hydraulic Resources
EAH	=	Enterprise of Hydraulic Usage
EIA	=	Environmental Impact Assessment
EIRR	=	Economic Internal Rate of Return
FIRR	=	Financial Internal Rate of Return
GDP	=	Gross Domestic Product
GEF	=	Global Environmental Facility
GNP	=	Growth National Product
GOC	=	Government of the Republic of Cuba

GOJ	=	Government of Japan
GTE	=	State Working Group for Cleaning Up, Conservation and Development for the Havana Bay
IDB	=	Inter-American Development Bank
IMF	=	International Monetary Fund
INRH	=	National Institute of Water Resources
ISO	=	International Standards Organization
JBIC	=	Japan Bank of International Cooperation
JICA	=	Japan International Cooperation Agency
LBS	=	Land Based Sources
MINAG	=	Ministry of Agriculture
MINBAS	=	Ministry of Basic Industry
MININT	=	Ministry of the Interior
MINSAP	=	Ministry of Health
MINTRANS	=	Ministry of Transport
MINVEC	=	Ministry of Foreign Investment and Economic Collaboration
MIP	=	Ministry of Fisheries
MIZC	=	Integrated Management of Coastal Zones
NC	=	Norma Cubanas (National Standard)
NGO	=	Non-Governmental Organization
NPV	=	Net Present Value
O/M, O&M	=	Operation and Maintenance
ONAT	=	National Office of Tax Administration
Ps	=	Cuban Peso
ROA	=	Return on Assets
SAMARP	=	National Company for Port Sanitation
SCF	=	Standard Conversion Factor
SERF	=	Shadow Exchange Rate Factor
SWRF	=	Standard Wage Rate Factor
UNDP	=	United Nations Development Programme
UNEP	=	United Nations Environment Programme
UNESCO	=	United Nations Education and Scientific Organization
UNICEF	=	United Nations Children’s Fund
USA	=	United States of America
WRC	=	Wider Caribbean Region
WS & S	=	Water Supply & Sewerage
WTA	=	Willingness to Accept
WTP	=	Willingness to Pay
WWTP	=	Wastewater Treatment Plant

APPENDIX-1

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APPENDIX-2

SEWER CROSS CONNECTION SURVEY

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SEWER CROSS-CONNECTION SURVEY

A2.1 INTRODUCTION

Following the cross-connection survey conducted in the first phase of this Study found that the cross-connection directly from the household is not common, INRH/Aguas de la Habana conducted a survey to identify locations of cross-connections to drains. Based on this latter survey results, a cross-connection survey was conducted on four of the locations to identify the cause and source.

A2.2 RESULTS

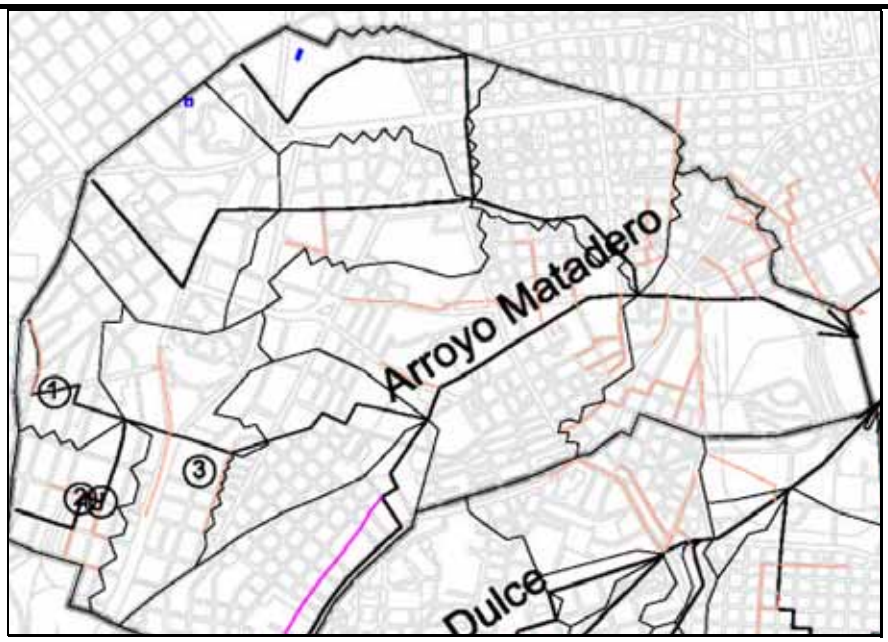
Out of the four locations it was possible to identify the origin or source of Cross-connection at three locations. Figure A2.1 shows the locations surveyed and Figures A2.1 through A2.3 show the results of the survey for the locations where origin or source was identified.

To eliminate the Cross-connections in these three locations following measures are required.

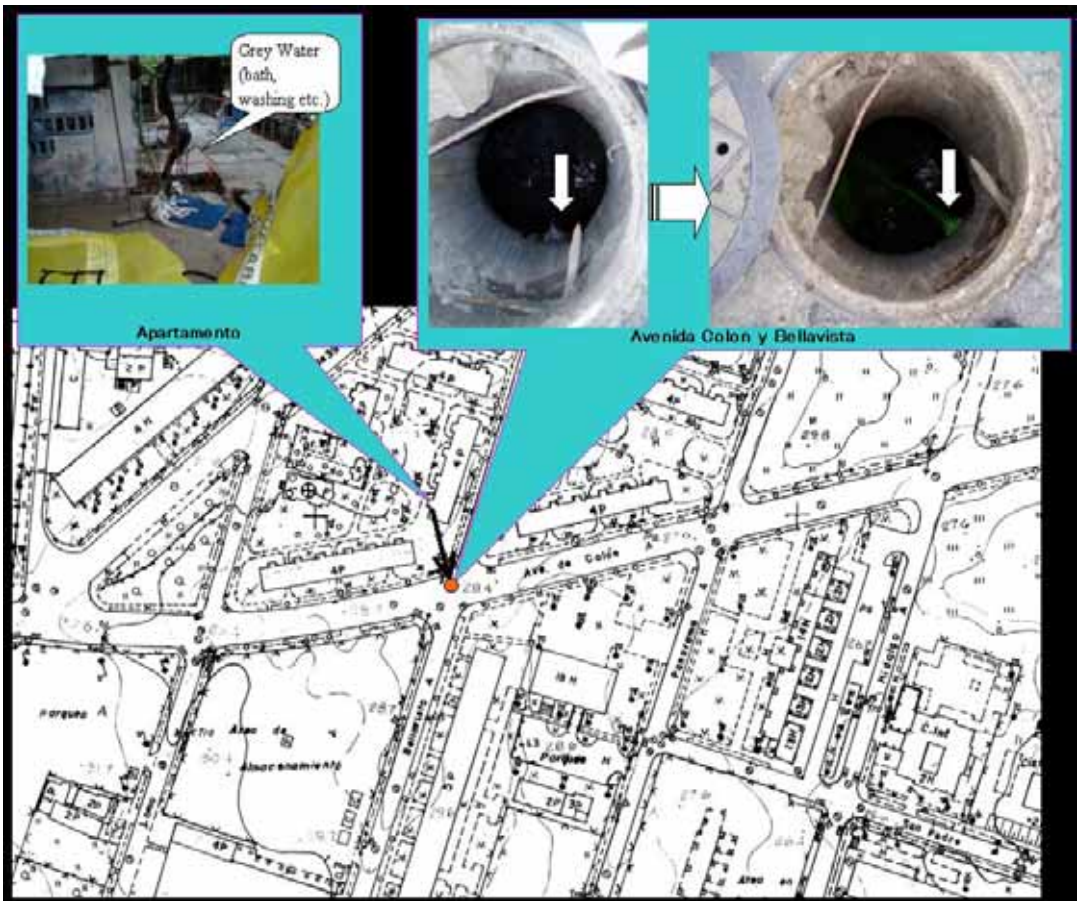
1. As exhibited in Figure A2.1 (at Avenida Colon y Bellavista) the Cross-connection is from an housing apartment block and only some part of the gray water is discharged. This Cross-connection can be eliminated easily by connecting to the nearest sewer main.

2. Figure A2.2 (at Tulipan y Estancia) shows the results of dye survey of an Cross-connection between a sewer manhole to a nearby drain manhole. Reason for Cross-connection could be either inadequate capacity of the nearest sewer or due to simple mistake. Elimination of this will require the investigation of existing capacity and elevation of sewer main.

3. Figure A2.3 (at Ermita y San Pedro) exhibits the results of an Cross-connection due to inadequate capacity of sewer. In this case, it will be necessary to construct a sewer line to increase the capacity of sewer.



Location Map



THE DEVELOPMENT STUDY ON THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY	Figure A2.1 Survey Location Map and Cross connection of Sewer Manhole of Housing Apartment to the nearby Drain
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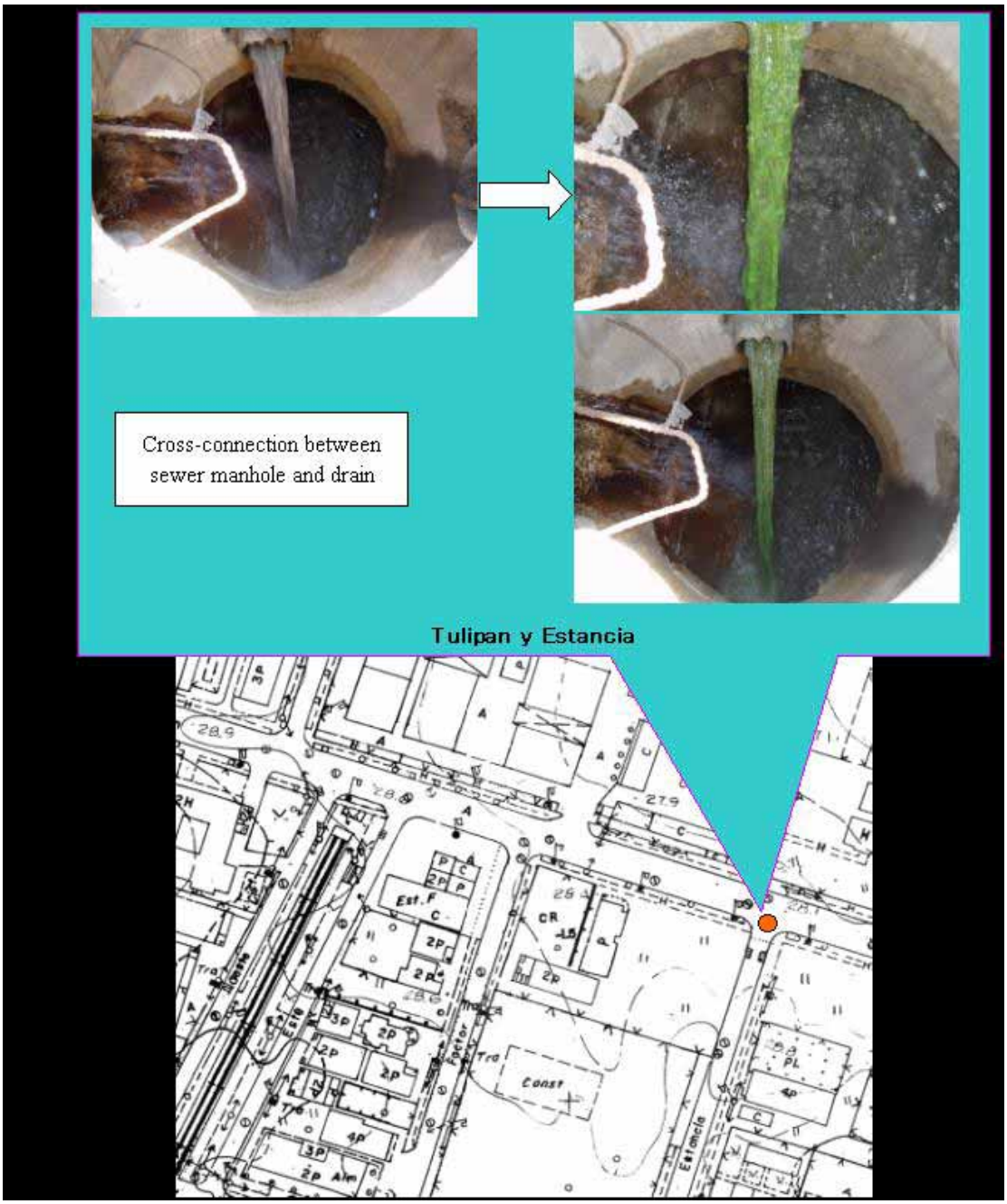

THE DEVELOPMENT STUDY ON THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY	Figure A2.2 Cross connection of Sewer Manhole to Drain due to Inadequate Sewer Capacity or by Mistake
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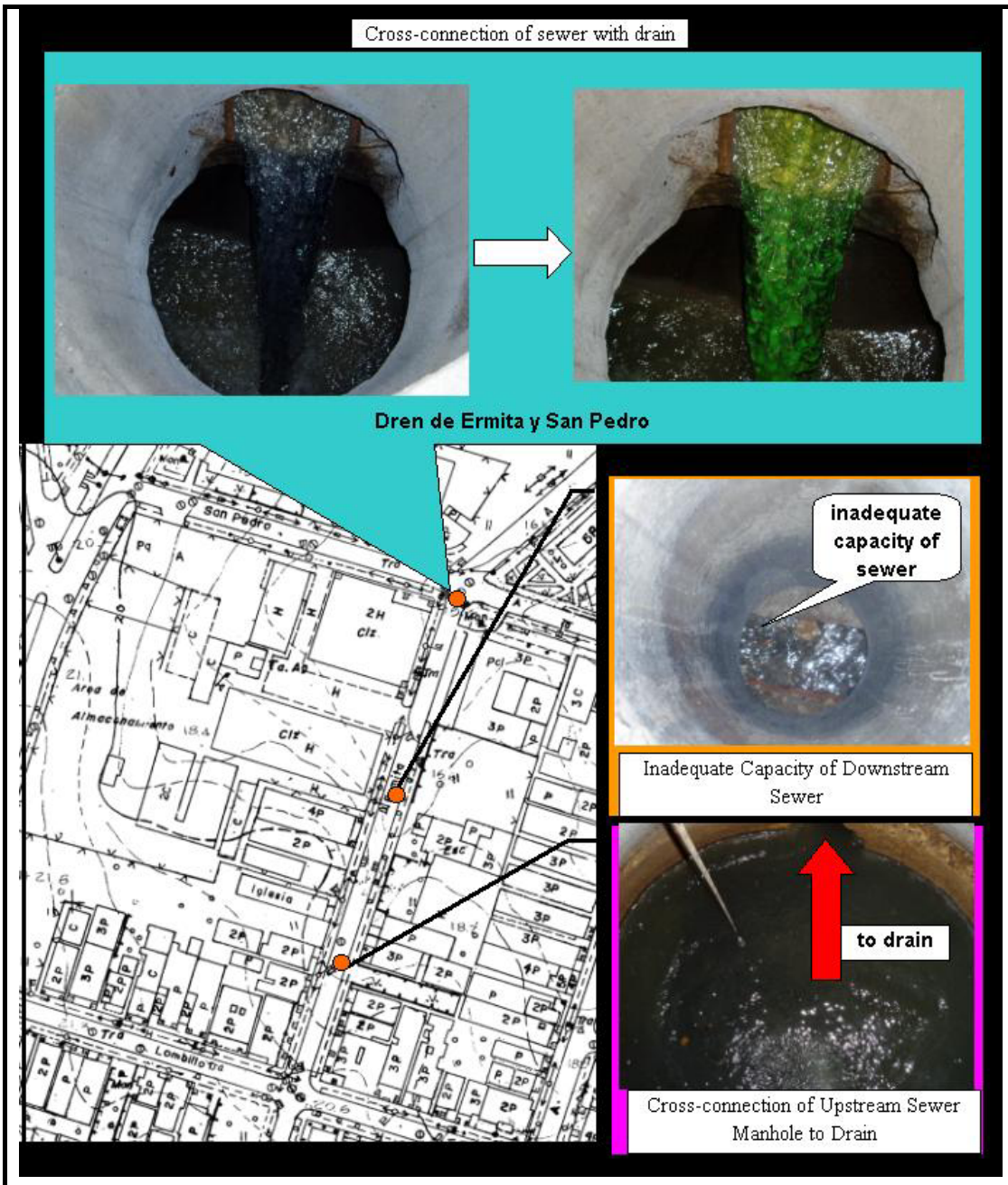

THE DEVELOPMENT STUDY ON THE IMPROVEMENT OF SEWERAGE AND DRAINAGE SYSTEM FOR THE HAVANA BAY	Figure A2.3 Cross connection of Sewer Manhole to Drain due to Inadequate Sewer Capacity
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