Centralized Sewage Treatment & Collection System, Spanish Town, St. Catherine, Jamaica

Feasibility Study and Master Plan

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Presentation Plan

I. Background & Objectives
II. Existing Situation
III. Data Collection & Analysis
IV. Alternatives Analysis
V. Recommended Solution
VI. Implementation Plan
VII. Conclusion

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Background & Objectives

NWC completed Capital Investment Programme, outcomes include:

- Increased access to central sewerage services to 35% of the population in the medium-term
- Increase to 50% in the long-term
  - Provide central sewage services to the largest urban centre (Spanish Town)
- Cole Engineering Group Ltd. was engaged by NWC to prepare a feasibility study and master plan for the development of a central sewage collection & treatment System for Spanish Town
  - Six months contract

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Background & Objectives

Benefits:

- Improve sewage collection and treatment in these centers
- Reduce pollution of surface & ground water
- Retire the large number of satellite sewerage facilities serving discrete housing developments
- Promote economies of scale by reducing incremental cost for this service provision
- Facilitate development & economic growth

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Existing Situation

- Eight (8) small discrete treatment plants servicing small developments in Spanish Town which are operated by NWC.
  - Plants not consistently meeting NEPA standards
  - In need of repair
- Two (2) other privately owned and operated treatment plants
  - White Water Meadows WWTP
  - Seville Meadows WWTP
- 19% of Spanish Town has access to treatment system

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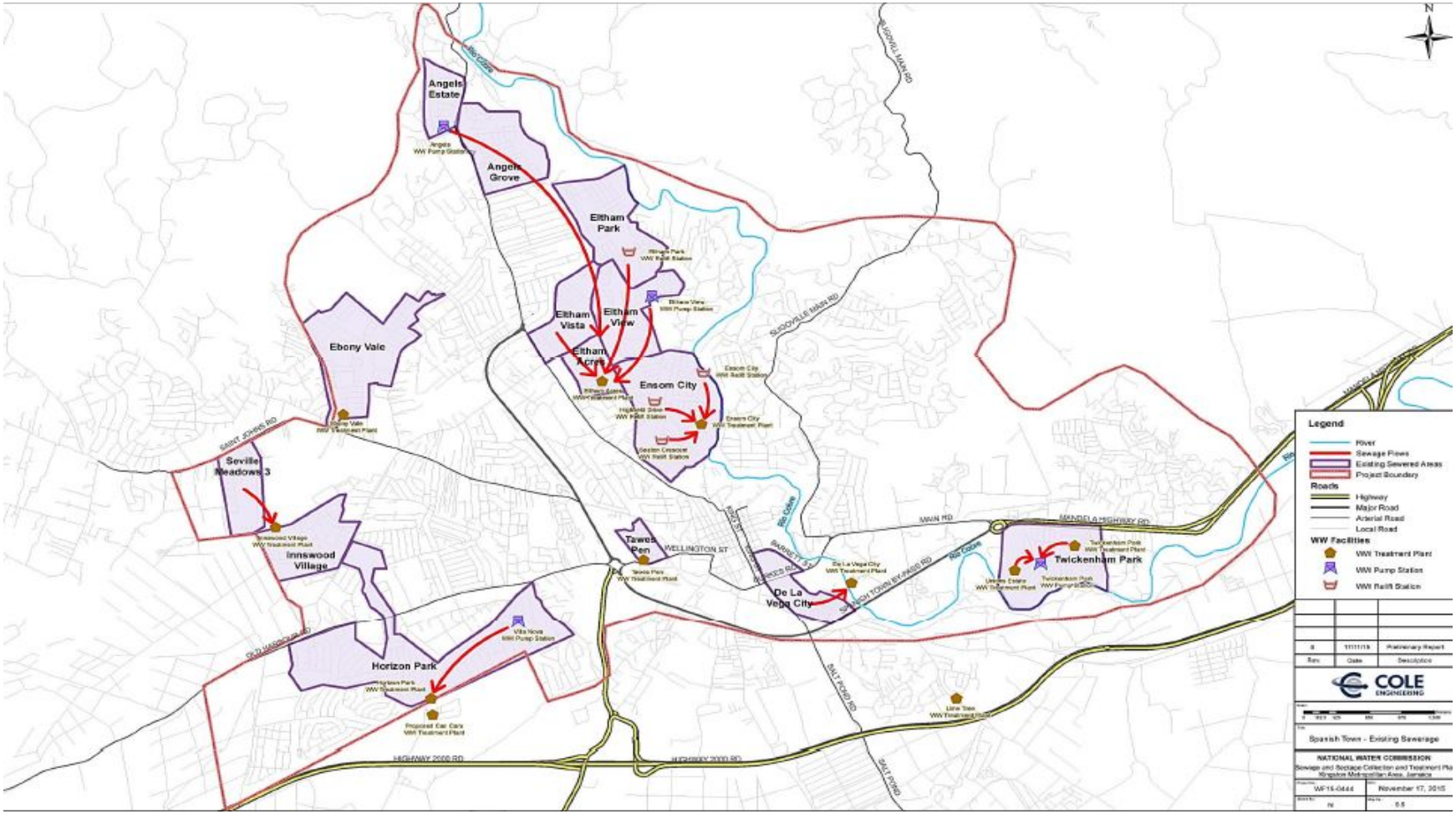
Existing Situation



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Data Collection & Analysis

- Data was collected from NWC and other agencies such as WRA, NEPA, NLA, Statin, etc. including but not limited to:
  - NWC Customer Billing
  - Census Information
  - Hydrogeological Basin Information
  - Reports on existing plants
  - Facility condition assessment was conducted on each WWTP
- Information collected as well as the assessment carried out were used to estimate the design hydraulic and organic loads for the 50-year design horizon; under the following assumptions

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Data Collection & Analysis

- Assumptions:
  - The current calculated residential, commercial and industrial per capita consumption will remain unchanged over the design horizon;
  - The per capita consumption is constant for the parish of St. Catherine;
  - 90% of the water used will return to the sewers (return factor);
  - Infiltration/inflow rate for existing sewers is the same in the parish of Kingston and St. Catherine;
  - Only 90% of the population in the sewered areas are connected; and
  - The quality of the influent in the existing sewered areas will not change.

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Alternative Analysis

- Initial screening process carried out to eliminate all unsuitable alternatives, including “do nothing”, to arrive at the 3 most feasible alternatives. These are:
  - Central Sewage Collection Network
    - Option 1 – Develop a central network that flows to the south-western boundary of Spanish Town and retire existing WWTPs
    - Option 2 - Develop a central network that flows to the north-western boundary of the Spanish Town and retire existing WWTPs
    - Options 3 – Develop new WWTP for the rest of Spanish Town & upgrade some of the existing WWTPs
  - Central Sewage Treatment Facility
    - Option A - Extended aeration activated sludge,
    - Option B - Sequencing batch reactor, and
    - Option C - Facultative Lagoons/wastewater stabilization ponds.

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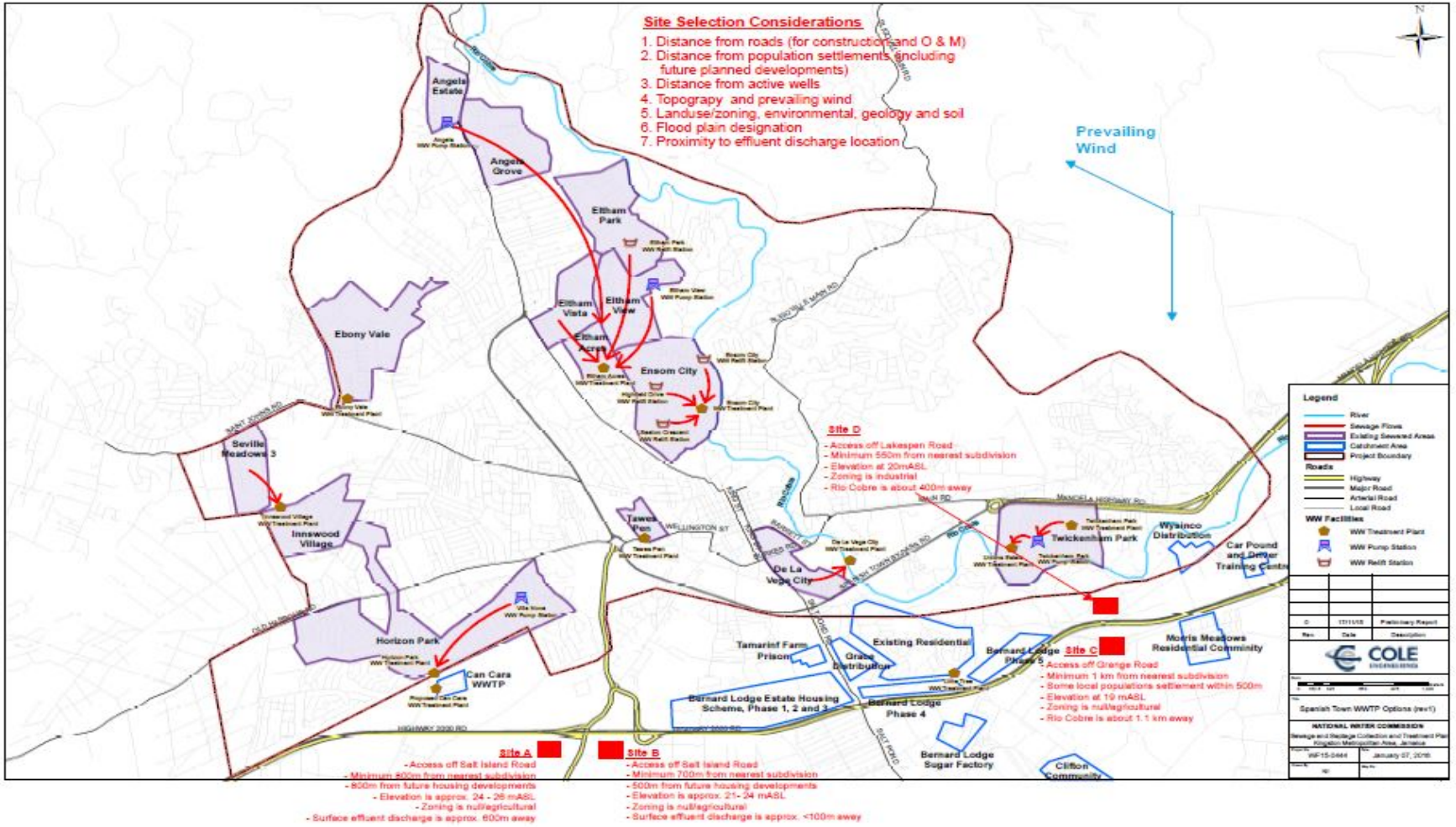
Alternative Analysis



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Alternative Analysis

- Detailed analysis was carried out on the 3 alternatives for both components, inclusive of quantitative and qualitative analysis
  - Four criteria were used, namely: technology, environmental impact, social/cultural impact, and financial impact.
    - Weightings ranging between 10 & 20 were assigned for each criteria
    - Rankings ranging between 0 & 4 were assigned for criteria

Rakings

Zero (0)	-	Does not fulfil criteria/sub-criteria
One (1)	-	Partially satisfies criteria/sub-criteria
Two (2)	-	Fairly satisfies criteria/sub-criteria
Three (3)	-	Substantially satisfies criteria/sub-criteria
Four (4)	-	Completely satisfies criteria/sub-criteria

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Alternative Analysis

Criteria	Criteria Notes	Criteria Weighting (10 - 20)	West Option	East Option	Hybrid Sub Option
Technical					
Constructability		10	1	5	5
Performance and capability consideration	ability for future expansion/modular	15	0	0	0
Proven technology		20	0	0	0
Operation and Maintenance	Energy efficiency, maintainability	20	5	5	4
Accessibility/ suitability		18	4	4	4
Safety	Occupational health and safety	20	2	4	3
Natural environmental					
Impacts on sensitive terrestrial habitats/species (flora and fauna)		10	3	3	3
Impacts on sensitive aquatic habitats/species		15	4	2	1
Impacts on groundwater/surfacewater systems		20	4	2	1
Social/Cultural/Legal:					
Local acceptability		12	5	4	3
Security and safety	Staff safety	18	1	1	1
Regulatory compliance		20	5	5	3
Consistent with applicable parish provincial and local plans		10	4	4	3
Short-term (construction) impacts on surrounding land users (odours, noise, traffic)		12	3	4	2
Long-term (operation) impacts on surrounding land users (odours, noise, traffic)		15	4	3	2
Archaeological impact		11	1	1	1
Property acquisition requirement	Easement	10	3	3	3
Financial					
Capital Costs	For collection system not the treatment system	15	3	3	2
Power Cost	Electricity/ fuel	18	3	4	3
Life Cycle Cost		18	4	4	3
Operation and Maintainance costs		18	4	4	3
Total Score			**990**	**1003**	**758**
Rank			**2**	**1**	**3**

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Alternative Analysis

Criteria	Criteria Notes	Criteria Weighting (10 - 20)	Extended Aeration	Wastewater Stabilisation Ponds	SBR
Technical					
Constructability		10	4	5	4
Performance and capability consideration	ability for future expansion/modul	15	5	3	5
Proven technology		20	5	3	1
Operation and Maintenance	Energy efficiency, maintenability	20	3	5	2
Safety	OHS	20	3	4	3
All Parameters achieved withour tertiary treatment		20	5	1	5
Narural environmental					
Impacts on sensitive terrestrial habitats/species (flora and fauna)		10	3	2	4
Impacts on sensitive aquatic habitats/species		15	3	5	3
Impacts on groundwater/surfacewater systems		20	4	3	3
Social/Cultural/Legal:					
Local acceptability		12	3	2	3
Regulatory compliance		20	5	3	2
Security and safety		18	4	3	4
Consistent with applicable parish provincial and local plans		0	0	0	0
Short-term (construction) impacts on surrounding land users (odours, noise, traffic)		12	2	2	2
Long-term (operation) impacts on surrounding land users (odours, noise, traffic)		15	3	2	3
Archaeological impact		0			
Property acquisition requirement		20	4	2	5
Financial					
Capital Costs		15	3	4	2
Power Cost	Electricity/ fuel	18	3	5	3
Life Cycle Cost		18	3	5	2
Operation and Maintainance costs		18	3	5	2
Total Score			**1154**	**1072**	**953**
Rank			**1**	**2**	**3**

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Recommended Solution

- The recommended approach for the collection and treatment sewage system in Spanish Town includes:
  - Central treatment facility
  - Two trunk sewers (East & West)
  - Collection Network

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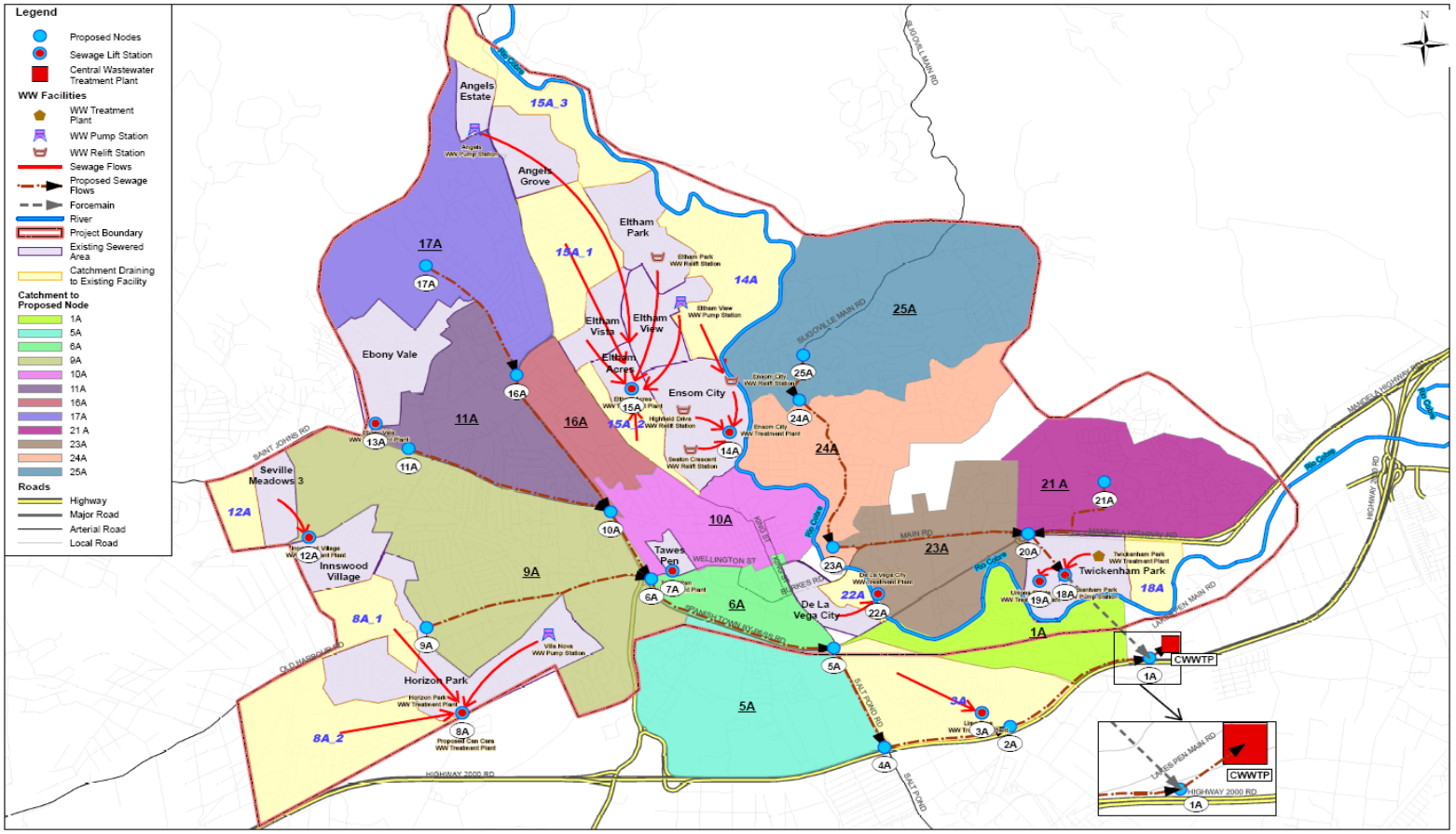
Recommended Solution

Central Sewer Collection Network



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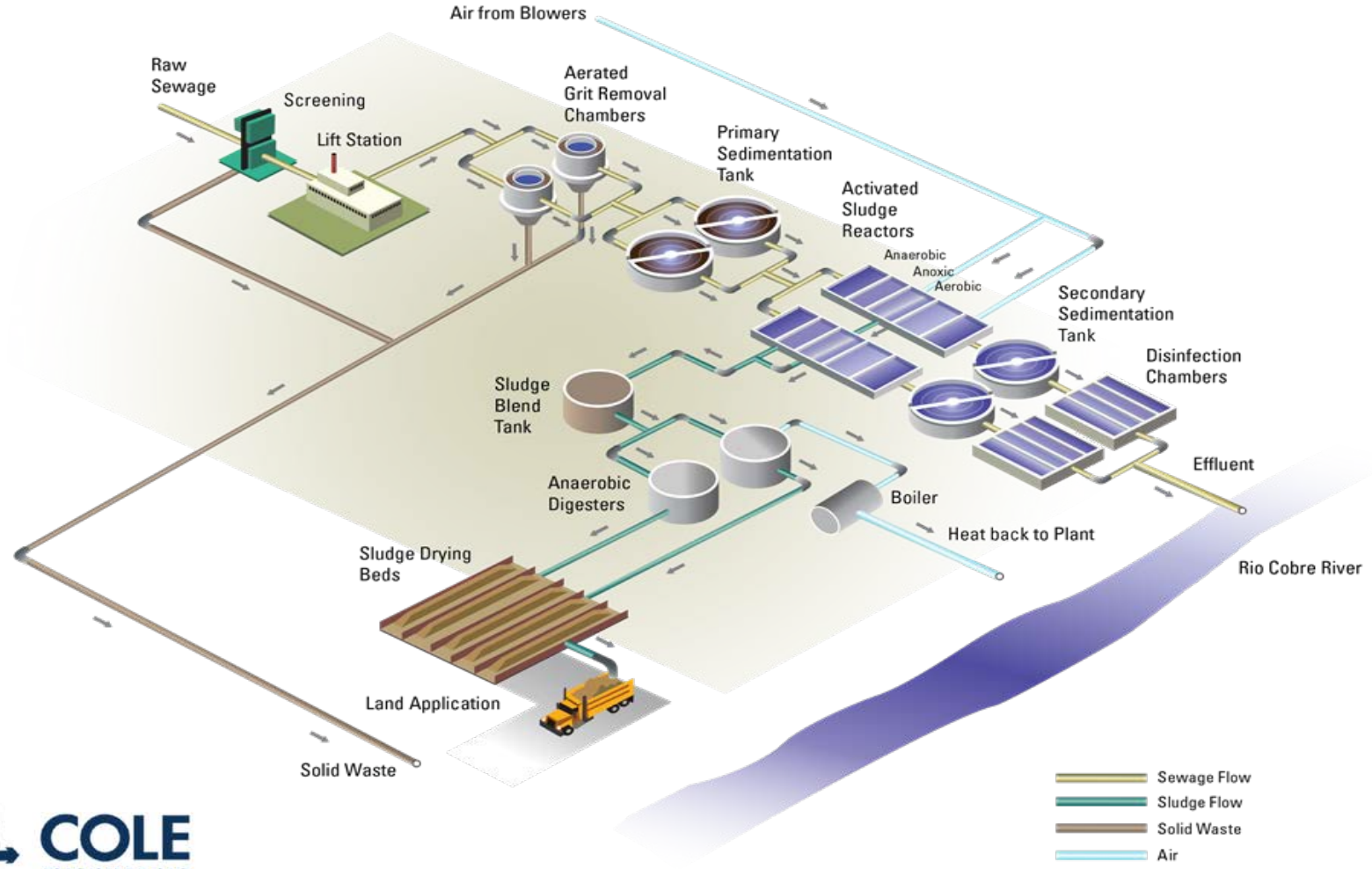
Recommended Solution

Central Sewage Treatment Facility – Extended Aeration Activated Sludge



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Recommended Solution

Parameter	NEPA Design specifications	CWWTP Design Specifications	NEPA Effluent Standard	CWWTP Expected Effluent	Unit
TSS	220	400	30	20	mg/L
BOD_5	250	350	20	<15	mg/L
COD	500	800	100	<100	mg/L
TN	40	40	10	<10	mg/L
TP	8	16	4	<4	mg/L
pH	6 -9	6-9	6 -9	6-9	
Temperature	28	28			^{O}C

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Implementation Plan

- The proposal is for the project to be implemented in 4 phases throughout the project lifecycle (2021 – 2071).
  - Phase 1 – Completion of detailed design, construction of WWTP, construction of trunk and retirement of existing WWTPs
  - Phase 2 - Expansion of the WWTP in the year 2031 to accommodate the projected population up to the year 2046
  - Phase 3 - Expansion will begin in the year 2046 to accommodate the projected population up to the year 2061
  - Phase 4 - Expansion will begin in the year 2060 to accommodate the projected population up to the year 2071

Implementation Plan

	Phase 1	Phase 2 Expansion	Phase 3 Expansion	Phase 4 Expansion
Construction Year	2019	2031	2046	2060
WWTP Commissioning Year	2021	2032	2047	2061
Design Year	2031	2046	2061	2071
Design Year Population	208,711	77,913	106,999	92,701
Cumulative Population served	208,711	286,624	393,623	486,324
Calculated WWTP Flows (m^3/d)	**35,063**	**13,089**	**17,976**	**15,574**
Actual WWTP Design Flow (m^3/d)	**35,000**	**14,000**	**18,000**	**16,000**
Cumulative Actual WWTP Design Flow (m^3/d)	**35,000**	**49,000**	**67,000**	**83,000**

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Conclusion

- The Master Plan prepared by Cole will serve as the roadmap for the construction of the central sewage system in Spanish Town.
- The sanitary treatment system will be in service to year 2071
- The project is estimated to cost approximately US $526 M

Thank You. Questions?

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