ZOFNASS PROGRAM
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Hyperion Wastewater Reclamation Plant Digester Gas Utilization Project (D-GUP)– Los Angeles, California

ENVISION ANALYSIS CASE STUDY

Figure 1: Hyperion Wastewater Reclamation Plant/Photo from https://sites.google.com/site/sed695b4/projects/fieldwork/hyperion-treatment-plant

The Zofnass Program at Harvard University
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John Daley, ENV-SP, prepared this Envision analysis case study under the supervision of Judith Rodriguez, ENV-SP and Cristina Contreras, ENV-SP, as part of the Harvard-Zofnass Program for Sustainable Infrastructure directed by Prof. Spiro N. Pollalis for the purposes of research and education. The analysis serves as a basis for research and class discussion for the development of case studies focused on the business case for sustainable infrastructure. The cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective project design or implementation.

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1. PROJECT DESCRIPTION & LOCATION

Hyperion Water Reclamation Plant (HWRP), owned and operated by the Los Angeles Bureau of Sanitation, is Los Angeles' biggest water treatment plant and the fifth largest water treatment plant in the world. One of the main byproducts of its water treatment processes is digestive gas, which poses a threat to outdoor air quality and odor. The goal of the Hyperion Water Reclamation Plant Digester Gas Utilization Project (DGUP) was to beneficially reuse these digestive gases for the purposes of electricity production and steam generation.

Completed in April 2017, DGUP generates renewable energy through two combustion turbine generators (CTGs) which have a combined power output of 22.7 megawatts. Additionally, two heat recovery steam generators (HRSGs) capture the exhaust from the CTGs and produce up to 50,000 pounds of process steam per hour. Some of this process steam is diverted to two steam turbine generators (STGs) that generate up to 5 megawatts of power. Over 80% of the fuel for these processes comes from digester gas, with the rest coming from natural gas on an as needed basis. The ultimate goal is to meet all of the plant's electric and steam needs using 100% digester gas.

Project 2406 is located within HWRP's energy recovery building, which was built in the 1980s but stopped being used in the 1990s. The project scope included decommissioning old equipment, designing, installing, and testing energy cogeneration equipment, and implementing emission controls. In addition, the contractor entered into a ten year contract for operating the facility following construction. The design and build aspects of the project cost $127 million, and the ten year operations and maintenance contract is priced at an additional $100 million.

2. EXECUTIVE SUMMARY OF ENVISION ASSESSMENT

The Digester Gas Utilization Project achieved an Envision Platinum award from the Institute for Sustainable Infrastructure, earning 55% of applicable credits across all categories and boosting Los Angeles' reputation as a global leader in wastewater treatment sustainability.

Although DGUP is an internal project within the Hyperion facility, it has several features that improve quality of life for the citizens of Los Angeles. For example, the project created 125 jobs in construction, with 30% of labor hours coming from local workers, 22% coming from apprentices (of which 46% were local), and 12% coming from disadvantaged workers (defined as a city resident who is making less than 50% of the area median income and/or facing adverse factors such as homelessness, chronic unemployment, past incarceration, or being a single parent). Noise and light pollution, often a problem with large power plants, were minimized to negligible levels by avoiding pneumatic tools, restricting construction schedules, directing lighting downward, and building far from facility boundaries with neighborhoods. At a broader level, the project supports community supported sustainability initiatives such as using renewable energy and conserving water, as outlined in the City Sustainability pLAn.

Leadership was DGUP's second highest scoring category by point total. One of the most salient aspects of the project was its logistical structure; while most municipal projects are design-bid-build, DGUP was organized as a bid-design-build-operate contract in which one entity (Constellation NewEnergy) worked with the Bureau of Engineering and Bureau of Sanitation throughout project delivery. This structure was chosen based on the Bureau of Engineering's limited expertise with digester gas utilization, but it had the benefit of streamlining project delivery and eliminating the barriers often faced by separate design and construction entities. Moreover, because Constellation NewEnergy is responsible for the first ten years of operations, their team was incentivized to build an efficient and durable facility. The project was structured with a high degree of stakeholder involvement as well, as evidenced by extensive communication with the South Coast Air Quality Management District about emissions controls and a variety of meetings, two separate open comment periods, and mailings to address public concerns. The project also earned significant points for utilizing digester gas and wastewater byproducts, planning for future expansion at Hyperion, and monitoring system performance and air emissions using manual and centrally automated controls.

Resource Allocation was the project's highest scoring category by far, responsible for over a quarter of the overall point total. During construction, the project optimized resource use by reusing over 80% of excavated material on site and sourcing 100% of soil, concrete, and steel locally. During operations, DGUP supplies all of Hyperion's electricity using an average of 87% biogas and 13% natural gas (the long term goal is to transition to 100% biogas). Water is conserved by using treated HWRP water for 98.5% of water needs, and diverting 100% of process water back to HWRP headworks for treatment.

In the Natural World category, the project achieved 85% of applicable points. Highlights include the project's location on a greyfield site within Hyperion, and the design of stormwater basins to capture 100% of on site stormwater and redirect it to facility headworks for treatment.

In the Climate and Risk category, the project scored well for Los Angeles' thorough commitments to addressing climate change, HWRP's minimal reliance on fossil fuels and grid power, roofing and ground materials that reduce the heat island effect, and measures to mitigate extreme weather.

There are a few key areas for improvement in this project. For one, the project achieved zero points for several important applicable credits, including Provide Effective Leadership and Commitment, Reduce Net Embodied Energy, Use Recycled Materials, Provide for Deconstruction and Recycling, Reduce Energy Consumption. While high scores in other categories allowed the project to achieve 55% of overall points, achieving at least a score of Improved in the aforementioned categories would demonstrate a more holistic approach to sustainability. Another significant area of improvement lies within CR1.2 Reduce Air Pollutant Emissions, in which the project only earned Improved because of NOx emissions above South Coast Air Quality Management Standards.

3. APPLICATION OF THE ENVISION RATING SYSTEM

The Envision V2 system is a set of guidelines that aid in optimizing the sustainability of an infrastructure project during the planning and preliminary design phases, as well as a means to quantify the relative sustainability of the project. In this case study, the infrastructure to be assessed is the Hyperion Wastewater Reclamation Plant Digester Gas Utilization Project.

Envision consists of 60 credits grouped into five categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Risk. Each credit pertains to a specific indicator of sustainability such as reducing energy use, preserving natural habitat, or reducing greenhouse gas emissions. Those credits are rated on a five-point scale referred to as a 'level of achievement': 'improved', 'enhanced', 'superior', 'conserving', and 'restorative'. Evaluation criteria are provided to determine if the qualifications for each level of achievement have been met for a particular credit. In each of the five categories there is a specific credit called "Innovate or exceed credit requirements". This is an opportunity to reward exceptional performance that applies innovative methods within the subjects that Envision evaluates.

The criteria for the levels of achievement vary from credit to credit, but generally an 'improved' level of achievement is awarded for performance that slightly exceeds regulatory requirements. 'Enhanced' and 'superior' levels indicate additional gradual improvement, while 'conserving' often indicates performance that achieves a net-zero or neutral impact. 'Restorative' is the highest level and is typically reserved for projects that produce an overall net positive impact. The Envision system weighs the relative value of each credit and level of achievement by assigning points. Credit criteria are documented in the Envision Guidance Manual, which is available to the public on the ISI[1] and Zofnass Program[2] websites.

[1] www.sustainableinfrastructure.org
[2] www.zofnass.org

3. ANALYSIS BY ENVISION CREDIT

QUALITY OF LIFE		
	Hyperion Wastewater Reclamation Plant: Los Angeles, CA	
QL1.1 Improve Community Quality of Life	**10**	**Superior** The project met a Superior level of achievement for its support of community sustainability goals, robust community engagement process, and mitigation of construction noise, air quality, and greenhouse gases. All projects undertaken by the Bureau of Engineering for the Bureau of Sanitation fall under the Bureau of Sanitation's Clean Watershed Program and Watershed Protection program. These programs are meant to address three major city initiatives: the Mayor's Sustainable City pLAn, the One Water LA Master Plan, and the Odor Control Master Plan. These plans include goals of green jobs, healthy air quality, environmental justice, reduced fossil fuel usage, management of odorous gases, and improvements in water infrastructure, and they were created with significant public input. Thus, at a broad level, all Bureau of Engineering projects are designed to align with community needs. In addition, project 2406 led robust outreach efforts in the community surrounding Hyperion Water Reclamation Plant, El Segundo. Prior to design, an Initial Study was distributed to 50 government agencies, 10 neighborhood councils, 30 NGOs, 20 local businesses, and 1600 residential property owners. This led to a 30 day public comment period and a public meeting, during which time concerns were raised about topics such as local air quality and the construction schedule. The project team incorporated this feedback into their Draft Environmental Impact Report, which included an additional 45 day public comment period. Moreover, the project team continued to meet quarterly with local citizens and community stakeholders during construction and operations through the newly created El Segundo Citizens Forum. The Draft Environmental Impact Report addressed several potential adverse impacts to the host community. First, the report outlines a plan to dispose of previously decommissioned equipment and associated hazardous materials to make room for the biodigesters. In addition, because of the large footprint of the Hyperion facility, no significant impact on community noise levels would result from construction. The most significant impacts related to air quality and greenhouse gas emissions. With regards to air quality, the project is required to meet Best Available Control Technology and Lowest Achievable Emission Rate Requirements (more information available in CR1.2). With regards to greenhouse gases, the project replaces natural gas with biogas, a carbon neutral fuel (for an in depth explanation, see RA2.2).

		Mayor Eric Garcetti. City Sustainable pLAn. P. 16-20. *City of Los Angeles. One Water LA. 2015. p. 1.1-1.2, 3.1-3.2.* *City of Los Angeles. Sewer Odor Control Master Annual Report. 2013. p. 5, 23-24.* *Environ International on behalf of City of LA Bureau of Engineering. Initial Study for Hyperion Treatment Plant Digester Gas Utilization Project. March 2011.* *Environ International on behalf of City of LA Bureau of Engineering. Draft Environmental Impact Report for Hyperion Treatment Plant Digester Gas Utilization Project. May 2013.* *Hyperion-El Segundo Citizens Forum Meeting Minutes. September 6, 2017.* *South Coast Air Quality Management District. Hyperion Treatment Plant Permit to Operate. September 2016.*
QL1.2 Stimulate Sustainable Growth & Development	**1**	**Improved**
		This project met an improved level of achievement through its investments in public infrastructure and support of local jobs. $227 million was allotted to the project in total; $127 million for design and construction, and another $100 million for a ten year operations and maintenance contract. Most of this funding went to outside contractors and subcontractors, with the rest allotted to city engineers. During the two year construction process alone, over 500,000 hours of labor were performed by construction workers, equivalent to 125 full time jobs. The project also generated jobs for supervisors, engineers, inspectors, and administration. To achieve higher levels for this credit, the project would have had to substantially improve public infrastructure and create new opportunities for businesses and communities.
		Mayor Eric Garcetti. Recommendation to Award Contract for the Hyperion Treatment Plant Digester Gas Utilization Project. November 2013. *Constellation New Energy, Inc. Project Schedule of Values. March 29 2018.* *City of LA Online Certified Payroll Supporting System. Construction Labor Report for HTP Digester Gas Utilization Project 2012-2017. December 6 2017.*
		Restorative

QL1.3 Develop Local Skills and Capabilities	**15**	The project met a restorative level of achievement for its progressive hiring guidelines and worker training protocols. Following the City of Los Angeles' Business Inclusion Program, the project team placed an emphasis on hiring women, minority, disadvantaged, and local workers. In total, a little over 8% of the $127 million design/build contract value was awarded to subcontractors owned minority, women, and other traditionally underrepresented groups. Furthermore, 30% of labor hours came from local workers, 22% of labor hours came from apprentices (of which 46% were local), and 12% came from disadvantaged workers (defined as a city resident who is making less than 50% of the area median income and/or facing adverse factors such as homelessness, chronic unemployment, past incarceration, or being a single parent). In addition, the project supports long term community competitiveness by training workers in the operations and maintenance of a cutting edge energy facility. The contractor is responsible for training the site manager and other supervisory personnel for the long term operations of the facility. The project team also outlined safety, technical, and operations training guidelines for general employees at the DGUP facility, strengthening the skill base of the local workforce and providing a template for future renewable energy developments in the area.
		City of Los Angeles. Business Inclusion Program Outreach Documentation and Process. *City of Los Angeles. Project Labor Agreement. 2015-2020. P.24-25.* *LA Bureau of Sanitation. Agreement for the Development of the Hyperion Treatment Plant Digester Gas Processing System between the City of Los Angeles and Constellation New Energy. Appendix 7 Subcontractor Outreach Program. 2013.* *LA Bureau of Sanitation and Bureau of Engineering. Specifications for Hyperion Treatment Plant Digester Gas Utilization Project. Section 01820 Operations and Maintenance Training. November 19 2013.*
QL2.1 Enhance Public Health And Safety	**16**	**Conserving**
		Conserving

QL2.2 Minimize Noise And Vibration	**8**	The project met Conserving by modeling construction and operational noise and vibration and mitigating impacts to the community. The operating noise of HWRP increased only slightly with the addition of the DGUP. Moreover, the operational noise levels would still be well below City of LA Noise Control Ordinance standards. Due to strategies such as restricted weekday construction schedules, noise testing, equipment maintenance, and avoidance of pneumatically powered tools, there were no significant noise threats from project construction either. Vibrational impacts were negligible. Most importantly, due to the large acreage of the Hyperion plant, residential communities are more than 500 feet away from the project. Thus, the small increases in construction and operational noise had no impact on communities.
		Los Angeles County. Noise Control Ordinance of the County of Los Angeles. 1978. *Environ International on behalf of City of LA Bureau of Engineering. Draft Environmental Impact Report for Hyperion Treatment Plant Digester Gas Utilization Project. Section 3.3: Noise. May 2013.*
QL2.3 Minimize Light Pollution	**8**	**Conserving**
		The project achieved conserving levels of achievement by completing a lighting needs assessment, eliminating illumination of the night sky, and using energy efficient LED lighting. While safety protocols require the facility to be well lit 24 hours a day, the project did not increase ambient lighting outside the property boundaries. A small amount of exterior lighting was added as well, but all lighting was directed downwards to minimize spillage into the night sky. LED lighting efficiencies were in accordance with the Illuminating Engineering Society of North America standards. Moreover, the LED lighting was proven to be more cost effective in the long term than fluorescent and metal halide bulbs.
		LA Bureau of Sanitation and Bureau of Engineering. Specifications for Hyperion Treatment Plant Digester Gas Utilization Project. Section 16500 Lighting. November 19 2013.
QL2.4 Improve Community Mobility And Access	**4**	**Enhanced**
		The project avoided any major disturbances to community mobility and Hyperion operations during construction, thereby earning a score of Enhanced. The Draft Environmental Impact Report concluded that the only effect of DGUP on community mobility would be an insignificant increase in vehicles traveling to HWRP for construction. In order to mitigate possible traffic delays associated with a few large equipment deliveries, the project team mandated the deliveries to occur during the night, when traffic was negligible. In addition, the project team coordinated with Bureau of Sanitation management to ensure construction activities did not interfere with

		Hyperion's daily operations. The DGUP will cause an increase of around 10-20 deliveries per year to Hyperion during operations, which will not have a significant effect on local congestion.
		Environ International on behalf of City of LA Bureau of Engineering. Initial Study for Hyperion Treatment Plant Digester Gas Utilization Project. March 2011. p.60-62.
QL2.5 Encourage Alternative Modes of Transportation	**0**	**Not Pursued**
QL2.6 Improve Site Accessibility, Safety & Wayfinding	**3**	**Enhanced** The new DGUP includes signage that allows users to safely and easily navigate around the facility, thereby earning a score of Enhanced. While the facility is well labeled for operational convenience, the project team primarily earned points for this credit through its safety planning. The DGUP facility includes visual signage, emergency lighting, and an alarm system to help staff navigate safely during an emergency. The project also added fences and hazard signs for two newly installed voltage transformers outside on HWRP grounds. The project team drafted emergency procedures for DGUP that were distributed to all relevant local agencies, and because the DGUP is located in a previously retired energy recovery building, it's construction did not affect emergency plans for the rest of HWRP. To achieve a higher score, the project would have had to be well integrated with the community, an inherent impossibility due to the projects internal location within Hyperion.
		LA Bureau of Sanitation and Bureau of Engineering. Specifications for Hyperion Treatment Plant Digester Gas Utilization Project. Section 10400 Identifying Devices, Section 16430 Life Safety Fire Alarm Systems. November 19 2013.
QL3.1 Preserve Historic And Cultural Res	**N/A**	**Not Applicable**
QL3.2 Preserve Views And Local Character	**N/A**	**Not Applicable**
	N/A	**Not Applicable**

QL3.3 Enhance Public Space		
QL0.0 Innovate Or Exceed Credit Requirements	**N/A**	*Not Pursued*
	65	

LEADERSHIP		
	Hyperion Wastewater Reclamation Plant: Los Angeles, CA	
LD1.1 Provide Effective Leadership And Commitment	**0**	**No Level** While the city of Los Angeles and its Bureau of Engineering and Bureau of Sanitation have shown a strong commitment to sustainability with regards to this project and city operations as a whole, not all members of the project team demonstrated explicit commitment to sustainability as required by this credit. In particular, Constellation NewEnergy, a multifaceted national energy company and recipient of the Design/Build contract, did not have documented commitments to sustainability. *Mayor Eric Garcetti. Sustainable City pLAn. p. 2.* *Mayor Eric Garcettti. Executive Directive No. 7. April 8, 2015.* *City of Los Angeles Bureau of Sanitation. Strategic Plan 2015/16-2020/21* *City of Los Angeles. Public Works Bureau of Engineering. Strategic Plan.* *Joe Buscaino, Councilmember. Los Angeles Envision Motion. October 18, 2016.*
LD1.2 Establish A Sustainability Management System	**0**	**Not Pursued**
		Conserving

LD1.3 Foster Collaboration And Teamwork	**15**	Project D-GUP featured a high degree of collaboration between the Bureau of Engineering, the Bureau of Sanitation, and the main contractor, Constellation NewEnergy. It earned a score of Conserving. The logistical structure of the project was ideally suited for collaboration. While most public works projects are design-bid-build, project D_GUP was a bid-design-build contract. As the awardee of the contract, Constellation NewEnergy was thus responsible for design and construction, which streamlined project delivery and eliminated the barriers to collaboration often faced by separate design and construction entities. Despite not being responsible for design or construction, the Bureau of Sanitation and the Bureau of Engineering worked closely with Constellation NewEnergy during kick off meetings and design reviews at the 30%, 60%, and 90% completion stages. Risk and reward sharing was a meaningful part of this project. In addition to being responsible for design and construction, Constellation NewEnergy entered into a ten year operations and maintenance contract for the beginning of DGUP operations. Under this contract, the City pays service fees for the operation and maintenance of DGUP, while Constellation processes digester gas, generates electricity and steam, disposes of residue, and maintains the system.This contract served to strengthen the relationship between the city and Constellation NewEnergy, while also incentivizing Constellation to build an efficient and long lasting energy generating facility. *LA Bureau of Sanitation. Agreement for the Development of Hyperion Treatment Plant Digester Gas Processing System Between the City of LA and Constellation NewEnergy. November 19 2013.* *City of LA Bureau of Engineering Environmental Engineering Division. DGUP Contract Kick-Off Meeting Minutes. March 11, 2014.* *LA Bureau of Sanitation. Contract for the Operation and Maintenance of the Hyperion Treatment Plant Digester Gas Processing System. November 19 2013.*
		Conserving

LD1.4 Provide For Stakeholder Involvement	**14**	The project team identified and engaged key stakeholders in the design process, thereby earning a score of Conserving. In addition to the Bureau of Sanitation (the owner of the project), Constellation NewEnergy (the design/build/operate contractor), and the city of Los Angeles decision making bodies (including the Board of Public Works, the City Council, and the Mayor's office), the project team identified two main outside stakeholders for the DGUP: the South Coast Air Quality Management District (the regulatory agency responsible for overseeing emissions permits) and the 15,000 citizens of El Segundo (the closest residential area to the facility). During pre-design, design, and construction, the project team worked with all of these stakeholders to streamline progress and resolve concerns. The South Coast Air Quality Management District was provided with advanced copies of the Initial Study and the Draft Environmental Impact Report, and continued to meet and email with the project team during the design process. This back and forth collaboration greatly streamlined the project's eventual air emissions permits, granted in September 2016. The project team engaged the community through a variety of meetings, mailings, and other public outreach activities, beginning with the Public Agency Scoping Meeting in April 2011 before any design work had been completed. Public comments were received during a 30 day window for the Initial Study and a 45 day window for the Draft Environmental Impact Report. Public concerns about health, air emissions, construction, and other topics were all responded to in person and through personalized letters. Moreover, during construction, the project team established the El Segundo Citizen Forum, a community forum which met with the project team on a quarterly basis during construction to raise concerns and stay up to date on progress.
		Environ International on behalf of City of LA Bureau of Engineering. Initial Study for Hyperion Treatment Plant Digester Gas Utilization Project. March 2011. p.60-62. *Environ International on behalf of City of LA Bureau of Engineering. Draft Environmental Impact Report for Hyperion Treatment Plant Digester Gas Utilization Project. May 2013. p.2-16.* *Hyperion-El Segundo Citizens Forum Meeting Minutes. September 6, 2017.* *South Coast Air Quality Management District. Hyperion Treatment Plant Permit to Operate. September 2016.*
		Restorative

LD2.1 Pursue By-Product Synergy Opportunities	**15**	DGUP repurposes a waste product from water treatment into an energy source for the plant and uses treated HWRP water as a cooling source, thereby earning the project a score of Restorative. As part of the wastewater treatment process at HWRP, organic waste is broken down by bacteria in an anaerobic (no oxygen) environment, producing a methane rich biogas. Historically, HWRP had sent this biogas to the nearby Scattergood Generating Station for energy and steam conversion. However, the biogas generating stations at Scattergood were decommissioned in 2017. Given the closing of Scattergood Generating Station, the Bureau of Sanitation evaluated many alternative users for the HWRP biogas, including piping it to local utilities and refineries, but found these proposals to be infeasible. Ultimately, the most cost effective, environmentally friendly, and logistically feasible option was determined to be utilizing the digester gas for an energy facility within HWRP. The DGUP converts 40% of HWRP's biogas into power and process steam, which is used to support HWRP operations. Additionally, effluent water from HWRP is used as a source of cooling water for the turbines. Currently, 60% of the biogas is flared off and not used for a beneficial purpose. The long term goal of the Bureau of Sanitation is to use 100% of the biogas.
		City of LA Bureau of Sanitation. Best Use of HTP Digester Gas Presentation. March 10, 2010. *City of Los Angeles Bureau of Sanitation. Request for Proposals for A Development Project to Make the Best Use of Hyperion Treatment Plant Digester Gas for the City of Los Angeles. 2011.* *City of LA Bureau of Engineering. Hyperion Treatment Plant Digester Gas Utilization Project 100% Construction Documents. December 3 2015.*
LD2.2 Improve Infrastructure Integration	**3**	**Enhanced**
		The use of biogas byproducts from HWRP by DGUP for power generation is consistent with criterion A, project-wide system integration. However, the project did not bring other community infrastructure designs and completed works into consideration. Thus, the project earned an Enhanced level of achievement. *Note: The project team applied for Not Applicable. The verifier said criterion A was applicable while agreeing that criterion B is not, and granted a score of Enhanced. The project team never made a coversheet for any levels of achievement so no documentation was provided.
		Conserving

LD3.1 Plan For Long-Term Monitoring & Maintenance	**10**	The project team developed thorough operational, maintenance, and training requirements, thereby earning Conserving for this credit. As stipulated in the contract agreement, operation and maintenance manuals were created for every piece of installed mechanical, electrical, or instrumentation equipment. In turn, all equipment is checked by trained personnel at regular intervals to detect maintenance needs and ensure high performance. In addition, DGUP is monitored automatically in real time by Hyperion's Distributed Control System, which oversees all Hyperon processes. One of the most important components of this real time monitoring is a Continuous Emissions Monitoring System, which was designed to monitor flue gas to stay compliant with the SCAQMD permit. The Bureau of Sanitation has committed itself to providing sufficient resources for the long term success of DGUP. DGUP operations, training, and maintenance costs are specifically included in the 2017-2018 budget.
		LA Bureau of Sanitation. Contract for the Operations and Maintenance of the Hyperion Treatment Plant Digester Gas Processing System between the City of LA and Constellation NewEnergy, Inc. November 19 2013. Appendix 3 Scope of Operations and Maintenance Work. *Constellation NewEnergy. Distributed Control System for DGUP Interface with Honeywell Site Plan. October 2015.* *LA Bureau of Sanitation and Bureau of Engineering. Specifications for Hyperion Treatment Plant Digester Gas Utilization Project. Section 01782 Technical Manuals, Section 01820 Operations and Maintenance Training, Section 481980 Continuous Emission Monitoring System. November 19 2013.* *City of Los Angeles. Detail of Department Programs 2017-18 Budgets. April 2017. P.552 Bureau of Sanitation.*
LD3.2 Address Conflicting Regulations & Policies	**N/A**	**Not Applicable**
		Superior

LD3.3 Extend Useful Life	**6**	Project DGUP used a range of design strategies and materials to optimize long term durability, flexibility, and resiliency, thereby earning a score of Superior. To boost durability, the project team specified the use grade 316 stainless steel and protective coating in all materials to prevent corrosion in HWRP's coastal environment. The project team also elected to install a reverse osmosis system to further treat the HWRP process water used in cooling the energy turbines, helping to prevent biological fouling of the heat exchangers. These materials were shown to provide not only long term durability, but also long term cost savings for the city. The project also planned for a future expansion at HWRP that will increase the production of digester gas from 7.2 to 9.4 million standard cubic feet per day by delineating space for a third turbine generator. Adjustable mechanical hoist systems that allow easy movement of large equipment were included in the project design as well to provide flexibility in future equipment configuration and facilitate future expansion. Lastly, operations and maintenance manuals for every piece of equipment ensure that DGUP will run smoothly for years.
		Vanderweil Engineers, LLP. DGUP Secondary Effluent Water Quality Analysis. September 2014. *LA Bureau of Sanitation and Bureau of Engineering. Specifications for Hyperion Treatment Plant Digester Gas Utilization Project. Section 15480 Water Treatment Systems, Section 05120 Structural Steel, Section 05500 Miscellaneous Metalwork, Section 09800 Protective Coating. November 19 2013.* *Constellation NewEnergy. Future Equipment Design Plans. November 7 2014.*
LD0.0 Innovate Or Exceed Credit Requirements	**0**	No Level
	63	

RESOURCE ALLOCATION		
	Hyperion Wastewater Reclamation Plant: Los Angeles, CA	
RA1.1 Reduce Net Embodied Energy	**0**	**Not Pursued**
		Enhanced

RA1.2 Support Sustainable Procurement Practices	**3**	The project met an Enhanced level of achievement for this credit. 56% of the project's purchased products, including turbines, gas compressors, boilers, transformers, and water treatment equipment, came from vendors with ISO 14001 certification. ISO 14001 verifies that companies have implemented an environmental management system and are actively looking for ways to reduce their environmental impact. Higher levels of achievement would require to be certified by a third party accreditation organization such as Green Seal, EPEAT, EcoLogo, and the like. *Constellation NewEnergy and Vanderweil Engineers. System Description Plant Control System for City of Los Angeles Hyperion Treatment Facility Digester Gas Utilization Project. DGUP Asset Summary. 2015.* *Lloyd's Register Quality Assurance. Dresser-Rand Group Inc ISO 14001:2004 Certification. October 3, 2016.* *United Registrar of Systems. Elliot Off-Site Solutions ISO 14001: 2004 standard. October 31 2017.* *Shin Nippon Machinery Co., LTD. Iso 14001 Certification. June 21 2018.*
RA1.3 Used Recycled Materials	**0**	**No Level**
RA1.4 Use Regional Materials	**10**	**Conserving** The project met Conserving by sourcing 100% of their materials locally. The total cost of materials for the project was $4.9 million. All soil was sourced from within a 50 mile radius, all concrete came from within a 100 mile radius, and all steel was sourced from within 500 mile radius. *Map and Table of Materials Sources (Provided in documentation by Envision SP for verification). 2018.*
RA1.5 Divert Waste From Landfills	**N/A**	**Not Applicable**
RA1.6 Reduce Excavated Materials Taken Off Site	**5**	**Superior** The project team implemented strategies to reuse 81% of excavated material on-site, therefore earning superior. 9,288 cubic yards of material were excavated for grading purposes, and 7,526 cubic yards were reused on-site as compacted fill. *LA Bureau of Sanitation and Bureau of Engineering. Specifications for Hyperion Treatment Plant Digester Gas Utilization Project. Section 02310 Earthwork.* *City of LA Bureau of Engineering Environmental Engineering Division. Project 2046 Cut and Fill Reuse Calculations. 2015.*
RA1.7 Provide for Deconstruction & Recycling	**0**	**Not Pursued**
RA2.1 Reduce Energy Consumption	**0**	**Not Pursued**

RA2.2 Use Renewable Energy	**16**	**Conserving**
		While small amounts of natural gas are used to supplement biogas in the DGUP, an average of 87% of the 27 MW of electricity produced by the project comes from biogas. Although the combustion of biogas produces carbon dioxide, it is considered a renewable resource because organic material is continually produced and reused, unlike fossil fuels. Therefore, the project earned a Conserving level of achievement.
		Environ International on behalf of City of LA Bureau of Engineering. Draft Environmental Impact Report for Hyperion Treatment Plant Digester Gas Utilization Project. May 2013. P. iv-v. *DGUP Overall Summary (Provided by project Envision SP). April 2017.*
RA 2.3 Commission & Monitor Energy Systems	**11**	**Conserving**
		The contractor coordinated an independent commissioning of the contract prior to operation and drafted thorough training standards for operations and maintenance personnel, thus earning a score of Conserving for this credit. As mentioned previously, project DGUP installed automated monitoring systems for equipment functioning, water quality, and air emissions that were integrated with HWRP's existing control room and distributed control system. The contractor also drafted detailed operations manuals and training protocols for plant staff. Following completion of construction, delivery of operations and maintenance manuals to the Bureau of Sanitation, and approval of city regulators, Constellation NewEnergy hired and trained Bluewater Energy Solutions, Inc. to startup and commission the facility as a third party.
		LA Bureau of Sanitation and Bureau of Engineering. Specifications for Hyperion Treatment Plant Digester Gas Utilization Project. Section 01820 Operations and Maintenance Training. November 19 2013. *Bluewater Energy Solutions. Commissioning Plan for Hyperion Digester Gas Utilization Project. 2014.*
		Conserving

RA3.1 Protect Fresh Water Availability	**17**	DGUP earned a level of Conserving because it has no net impact on water supplies; the power plant uses treated water from HWRP for 98.5% of its water needs. Most thermoelectric power plants use cooling water to continually condense the steam used to spin turbines. In fact, power plant cooling is responsible for around 40% of total freshwater use in the United States, making it the single largest use of water. DGUP mitigates its effects on water supplies by using treated water from HWRP for its cooling needs. The cool, treated water is sent through pipes, where it causes steam to condense for reuse in the power plant. Then, the treated water (now warm because it absorbed heat from the steam) is circulated through cooling towers, allowing it to be cooled off by the ambient air and reused. Depending on weather conditions, 3-10% of the water is lost to evaporation, and thus needs to be replaced by additional treated water. To protect the DGUP heat exchangers from biological, the treated water is first pumped through a reverse osmosis system prior to use. *City of LA Bureau of Sanitation. Request for Proposals for A Development Project to Make the Best Use of Hyperion Treatment Plant Digester Gas for the City of Los Angeles. 2011. P.15, 25-26.* *"Total Water Use in the United States." Total Water Use in the United States, www.usgs.gov/special-topic/water-science-school/science/total-water-use-united-states?qt-science_center_objects=0#qt-science_center_objects.* *Fleischli, Steve, and Becky Hayat. Power Plant Cooling and Associated Impacts. Natural Resources Defense Council, 2014.*
RA3.2 Reduce Potable Water Consumption	**17**	**Conserving** The project met a Conserving level of achievement for designing a closed loop system that allowed DGUP to achieve a nearly 100% reduction in potable water use. Industry norms for potable water consumption range from 400,000 to 1,000,000 gallons per hour for a 20 MW system*. DGUP only averages 12,530 gallons of potable water use per hour, or 0.31% of the norm. The potable water is needed for steam generation because of its high quality. The rest of the facility's water, which is needed for cooling, comes from HWRP (see RA3.1 for a brief explanation of cooling). Overall, DGUP uses about 20 million gallons of treated water and 300,000 gallons of potable water per day. Lastly, the Bureau of Sanitation is planning to install an advanced water purification facility at Hyperion in 2020 in order to eliminate the need for any potable water usage at DGUP. *this is based on industry averages, I don't have exact numbers for DGUP's location

		City of LA Bureau of Sanitation. Request for Proposals for A Development Project to Make the Best Use of Hyperion Treatment Plant Digester Gas for the City of Los Angeles. 2011. P.15, 25-26. *Bureau of Sanitation. One Water LA. Wastewater Facilities Plan Future System Needs for Hyperion Water Reclamation Plant.*
RA3.3 Monitor Water Systems	**11**	**Conserving** The Bureau of Sanitation effectively monitors the water usage of DGUP through both automated and manual controls, thereby earning the project a score of Conserving. The flow, temperature, and pH of water circulating into and out of the steam generator and cooling water system are continuously monitored to ensure adequate energy generating conditions. Moreover, the controls for DGUP are integrated with the controls for the entire HWRP via the Distributed Control System, an advanced management system designed by Honeywell. As a closed loop system, all cooling water and leftover process water is diverted back to HWRP headworks for treatment, after which most of it is discharged into LA Harbor. This discharge is continually monitored by the Distributed Control System to ensure it meets National Pollutant Discharge Elimination System permitting for pollutant levels, temperature, and salinity. *Evoqua Water Technologies. Process Water System Operation and Maintenance Manual. May 2016.* *City of LA Bureau of Sanitation. Distributed Control System for DGUP Interface with Honeywell Site Plan. 2018.* *California Regional Water Quality Control Board Los Angeles Region. Waste Discharge Requirements and NPDES Permit for City of LA Hyperion Treatment Plant. November 2010.*

RA0.0 Innovate Or Exceed Credit Requirements	**4**	The project received four innovation points for exceeding the requirements of RA1.4, and for overcoming significant design challenges to address unsuitable water quality. As mentioned in RA1.2 (Use Regional Materials), 100% of soil, steel, and concrete for DGUP—a total value of $4.89 million—was sourced locally. This procurement strategy contributed to sustainability by reducing pollution associated with materials transportation and supporting local economies. As mentioned in LD3.3 and RA3.1, the project team installed an advanced water treatment system in order to optimize the water quality of the steam used in energy generation and the HWRP water used for cooling. While the contractor had been expecting to use normal potable water and HWRP treating water, water quality analyses revealed that the level of dissolved solids, hardness, and pH posed a threat to equipment. To that end, the design plans were updated to include chemical feed equipment, anti-scalant injection systems, and a reverse osmosis system, as well as room for future expansion. While the reverse osmosis system caused some schedule and budget increases, it preserved the long-term integrity of the project. Sources: Vanderweil Engineers, LLP. DGUP Secondary Effluent Water Quality Analysis. September 2014. LA Bureau of Sanitation and Bureau of Engineering. Specifications for Hyperion Treatment Plant Digester Gas Utilization Project. Section 15480 Water Treatment Systems.
	94	

NATURAL WORLD		
	Hyperion Wastewater Reclamation Plant: Los Angeles, CA	
NW1.1 Preserve Prime Habitat	**N/A**	**Not Applicable**
NW1.2 Preserve Wetlands and Surface Water	**N/A**	**Not Applicable**
NW1.3 Preserve Prime Farmland	**N/A**	**Not Applicable**
		Superior

NW1.4 Avoid Adverse Geology	**3**	The project earned Superior for delineating all potentially sensitive geology on site and implementing runoff controls, spill prevention, and cleanup plans. As per the Bureau of Engineering Project Delivery Manual, the project completed a Geotechnical Report to assess earthquake faults, groundwater, tsunamis, and liquefaction. Like all developments in southern California, the project is near a fault (the Palos Verdes fault is 5.5 miles away). No other geologic hazards were found. The DGUP is designed to accommodate potential lateral movement from seismic shaking in accordance with risk category III, Design Category D, and Site Class D. Additionally, HWRP is a contained area; any stormwater runoff is collected by a drain system and directed back to headworks for treatment, mitigating risks to groundwater. Project DGUP installed two new catch basins in order to integrate with the facility drainage system. Lastly, the project team developed spill and leak mitigation plans that surpass safety codes and design standards. Aqueous ammonia, which is used for emission control, is stored in two 11,000 gallon stainless steel storage tanks within an above ground containment berm to catch spills, and there is a 25,000 gallon underground catchment area for secondary containment. Also included is an ammonia leak detector system, which is integrated with the Distributed Control System (see LD3.1) to provide continuous hazardous gas monitoring. *Charles Chen, Vanderweil Engineers, LLP. Geotechnical Report Hyperion Digester Gas Utilization Project. 2015.* *Michael Soto, Bureau of Sanitation. Hyperion Treatment Plant Spill Prevention, Control, and Countermeasure Plan. 2012.* *Vanderweil Engineers, LLP. Aqueous Ammonia Storage and Supply System for City of Los Angeles Hyperion Treatment Facility Digester Gas Utilization Project. 2016.*
NW1.5 Preserve Floodplain Functions	**N/A**	**Not Applicable**
NW1.6 Avoid Unsuitable Development on Steep Slopes	**N/A**	**Not Applicable**
NW1.7 Preserve Greenfields	**15**	**Conserving** The project is located entirely within a greyfield site, thus earning a score of Conserving.
		Restorative

NW2.1 Manage Stormwater	**21**	DGUP was designed to capture and repurpose 100% of stormwater, thereby earning the project a level of Restorative. HWRP captures all stormwater on its 144 acre site in catchment basins, after which it is drained and pumped to headworks for treatment to remove pollutants and impurities. Following treatment, the water is either purified further for use as recycled water (37 million gallons of water per day), discharged to an outfall five miles out in Santa Monica Bay (280 million gallons per day), or reused on site (10 million gallons per day). Two new catchment basins were built for DGUP.
		LA Bureau of Sanitation. Hyperion Treatment Plant Storm Water Pollution Prevention Plan. 2015. *All Area Plumbing, Inc. Hyperion Treatment Plant Digester Gas Utilization Project Catch Basin Submittal. October 2015.* *LA Bureau of Sanitation. Recycled Water Table FY 2014-2015. August 2015.*
NW2.2 Reduce Pesticides and Fertilizer Impacts	**N/A**	**Not Applicable**
NW2.3 Prevent Surface and Groundwater Contamination	**18**	**Restorative**
		DGUP earned Restorative by capturing and treating 100% of stormwater, thereby protecting ground and surface waters. As discussed in NW1.4, the project's Geotechnical Report determined that the project is not located near surface waters, and that construction would not impact groundwater. As discussed in NW2.1, all areas of HWRP are designed to collect stormwater and pump it to headworks for treatment. In addition, the water used in the operations of DGUP is continually collected and sent back to headworks. The treated water is discharged to a pipe extending five miles into Santa Monica harbor, sent to a water recycling facility for further purification, or beneficially used on site. All discharges are monitored in real time for pollutants, temperature, and salinity to ensure compliance with HWRP's National Pollutant Dischare Elimination System Permit. The most significant spill threat pertaining to DGUP is from aqueous ammonia, which is used for emissions control. Possible spills of aqueous ammonia are mitigated by a primary above ground containment berm and a secondary underground containment area.
		Charles Chen, Vanderweil Engineers, LLP. Geotechnical Report Hyperion Digester Gas Utilization Project. 2015. *Michael Soto, Bureau of Sanitation. Hyperion Treatment Plant Spill Prevention, Control, and Countermeasure Plan. 2012.* *Vanderweil Engineers, LLP. Aqueous Ammonia Storage and Supply System for City of Los Angeles Hyperion Treatment Facility Digester Gas Utilization Project. 2016.* *California Regional Water Quality Control Board Los Angeles Region. Waste*

		Discharge Requirements and NPDES Permit for City of LA Hyperion Treatment Plant. November 2010.
NW3.1 Preserve Species Biodiversity	**N/A**	**Not Applicable**
NW 3.2 Control Invasive Species	**N/A**	**Not Applicable**
NW3.3 Restore Disturbed Soils	**N/A**	**Not Applicable**
NW3.4 Maintain wetland and surface water functions.	**N/A**	**Not Applicable**
	0	*Not Pursued*
	57	

CLIMATE AND RISK		
	Hyperion Wastewater Reclamation Plant: Los Angeles, CA	
CR1.1 Reduce Greenhouse Gas Emissions	**0**	**No Level** Although the project team applied for Restorative for this credit, no level of achievement was given because no life cycle carbon assessment was pursued. See RA2.2 Use Renewable Energy for an explanation on why DGUP's biogas is a carbon nuetral fuel.
		Improved

CR1.2 Reduce Air Pollutant Emissions	**2**	The project is in compliance with California Ambient Air Quality Standards, thereby granting an Improved level of achievement. DGUP was granted a permit to operate by the South Coast Air Quality Management District, and all criteria air emissions are continually monitored during operations to ensure compliance. Although Operation-related emissions of NOx, VOCs, and particulate matter exceed South Coast Air Quality Management District thresholds, project operations are permitted because best available control technology requirements are met. Additionally, the project team hired a lead paint abatement consultant to ensure the demolition of old structures to make room for DGUP complied with applicable state and federal rules for construction safety and disposal. To earn higher levels of achievement, the project would have needed to reduce emissions of all criteria air pollutants below South Coast Air Quality Management District standards.
		Environ International Corporation. Mitigation Monitoring and Reporting Plan for Hyperion Treatment Plant Digester Gas Utilization Project. August 2013.
CR2.1 Assess Climate Threat	**15**	**Conserving**
		Due to the City of Los Angeles' strong internal climate assessment and adaptation plans, the project met a Conserving level of achievement. The Sustainable City pLAn includes strong commitments to prepare for the effects of wildfires, droughts, heatwaves, and rising sea levels in a changing climate. This document led to a Greater LA Climate Action Framework with guidelines for climate change response, as well as a One Water LA 2040 Report, with guidelines for water management. At the Bureau of Sanitation level, the Los Angeles Sanitation Climate Risk Assessment and Adaptation Measure Recommendations offers more specific goals and guidelines. These reports and plans were drafted with significant input from the community, state and federal regulators, the EPA, city officials, and other private and public stakeholders.
		Mayor Eric Garcetti. City Sustainability pLAn. p. 34-40, 66-73. *Los Angeles Regional Collaborative for Climate Action and Sustainability. A Greater LA Climate Action Framework. 2016.* *City of Los Angeles. One Water LA 2040 Plan. 2015. P 3.1-3.4.* *United States Environmental Protection Agency. Los Angeles Sanitation Climate Change Risk Assessment and Adaptation Measure Recommendations for Wastewater Assets. 2016.*
		Conserving

CR2.2 Avoid Traps And Vulnerabilities	**16**	Project DGUP assessed and mitigated resource traps and future plant growth, thereby earning a score of conserving. By utilizing biogas, a renewable and plentiful resource generated at the plant, DGUP minimizes HWRP's reliance on natural gas, which is subject to price fluctuations and could become scarce in the future. Similarly, DGUP reduces HWRP's reliance on the regional electrical grid. DGUP is also designed with room for a third combustion turbine generator to accommodate future increases in biogas production. Lastly, the cooling towers use treated water from HWRP, protecting DGUP from changes in potable water availability.
		Environ International on behalf of City of LA Bureau of Engineering. Draft Environmental Impact Report for Hyperion Treatment Plant Digester Gas Utilization Project. May 2013. p.2-16. *Constellation NewEnergy. Future Equipment Design Plans. November 7 2014.* *Bureau of Sanitation. One Water LA. Wastewater Facilities Plan Future System Needs for Hyperion Water Reclamation Plant.*
CR2.3 Prepare For Long-Term Adaptability	**16**	**Conserving**
		The project evaluated and prepared for the long term effects of climate change on water scarcity, storm intensity, and temperature, thus earning a score of Conserving. Design elements meant to ensure long term adaptability include catch basins to collect stormwater (see NW2.1), mounting equipment on elevated platforms of at least 40 inches to protect against flooding, using treated wastewater for cooling, and installing fans to provide increased ventilation to the cooling towers on hot days.
		LA Bureau of Sanitation. Hyperion Treatment Plant Storm Water Pollution Prevention Plan. 2015. *All Area Plumbing, Inc. Hyperion Treatment Plant Digester Gas Utilization Project Catch Basin Submittal. October 2015.* *LA Bureau of Sanitation. Recycled Water Table FY 2014-2015. August 2015.* *Constellation NewEnergy. Ventilation Fans Design Plans.*
CR2.4 Prepare For Short-Term Hazards	**0**	**No Level**
		The project team did not assess DGUP's vulnerability to future climate change scenarios and human induced hazards, two essential criteria for criterion A. Thus, no level was awarded.
CR2.5 Manage Heat Island Effects	**6**	**Conserving**
		Currently, urban areas surrounding LA are on average 5 degrees Fahrenheit cooler than the city. Following Los Angeles' goal of reducing this temperature differential by 1.7 degrees fahrenheit by 2025, The project designed 100% of its surface to be either shaded or have a solar reflectance index greater than 29 using ready mix concrete and white PVC roofing. It therefore met the Conserving level of achievement.

		Percentage of Area Minimizing Heat Accumulation Calculations (provided by project team for verification). *Carlisle Syntec Systems. Sure Flex White PVC Membrane Material Data Sheet. 2017.* *Medgar Marceau and Martha VanGeem. Solar Reflectance of Concrete for LEED Sustainable Sites Credit: Heat Island Effect. Portland Cement Association. 2007.*
CR0.0 Innovate Or Exceed Credit Requirements	**3**	*The project earned three innovation points for implementing innovative air emissions controls to meet air quality standards.* *DGUP's permit to construct and operate from the South Coast Air Quality Management District imposed the most stringent air quality emission requirements ever mandated on a large digester gas installation for nitrogen oxide (NOx) and carbon monoxide (CO). Overcoming a lack of precedent for such emissions controls, the project team designed successful CO catalysts, thermal oxidizers, and a siloxane* removal system to meet regulations.* *The project team's innovative approach to emissions control saved the DGUP project from significant scheduling delays and set a precedent for digester gas fired combustion projects nationwide.* **Siloxane is a contaminant found in digester gas that is known to interfere with CO catalysts and cause system failure.*
	58	

Points Achieved	337	**Hyperion Wastewater Reclamation Plant: Los Angeles, CA**
Available	611	
	55%	**Envision Platinum**

APPENDIX:
A: PROJECT PICTURES AND DRAWINGS

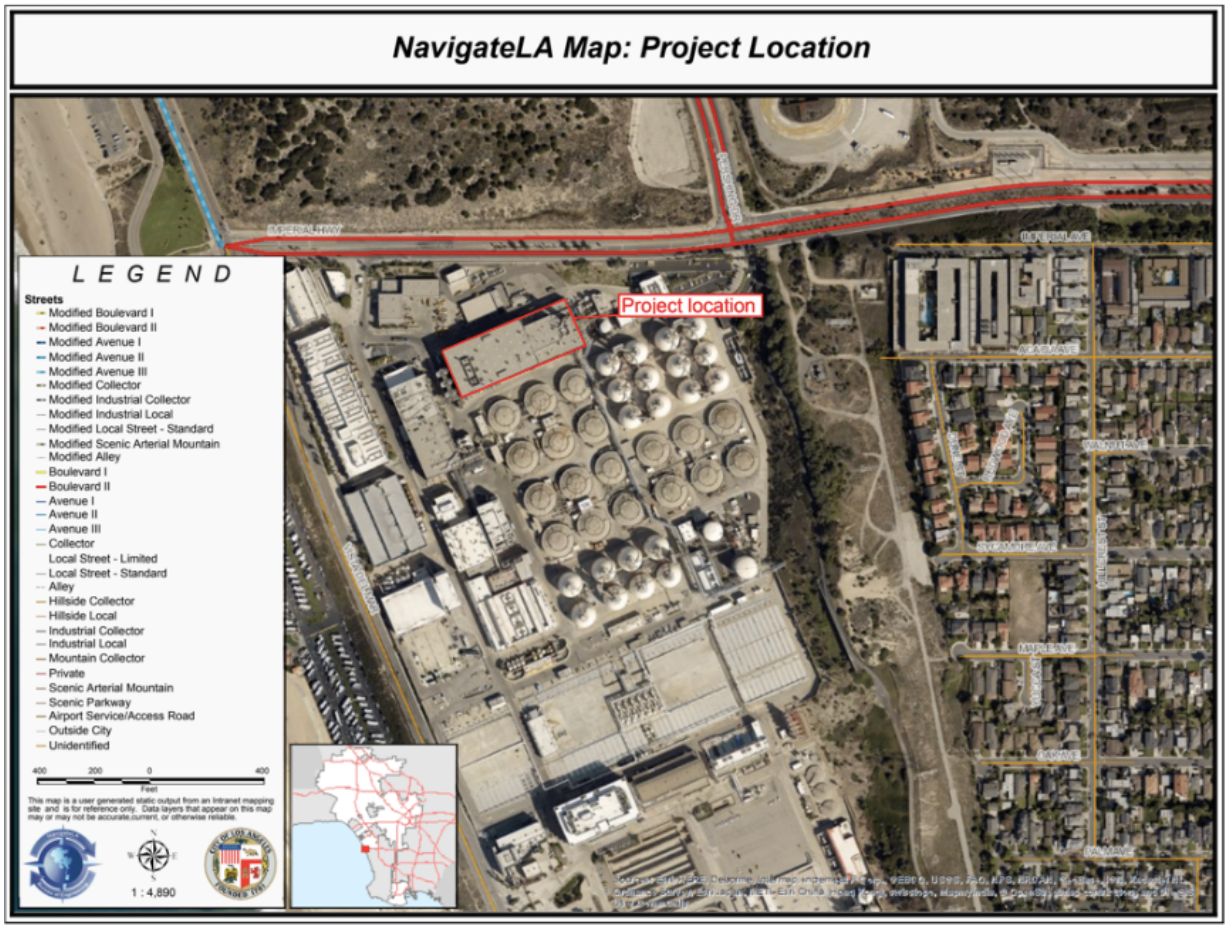


Figure 2: Map of Hyperion Wastewater Reclamation Plant, DGUP, and surrounding area/NavigateLA 2017

Figure 3: Zoomed out view of DGUP project/Photo from Institute for Sustainable Infrastructure, 2018

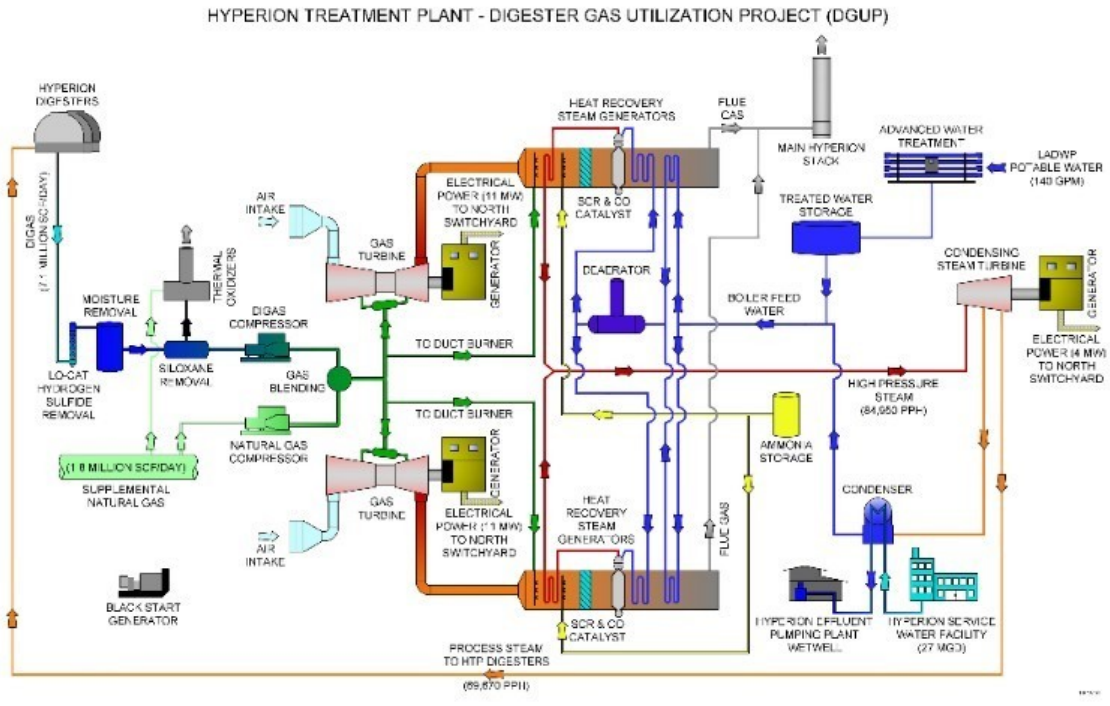


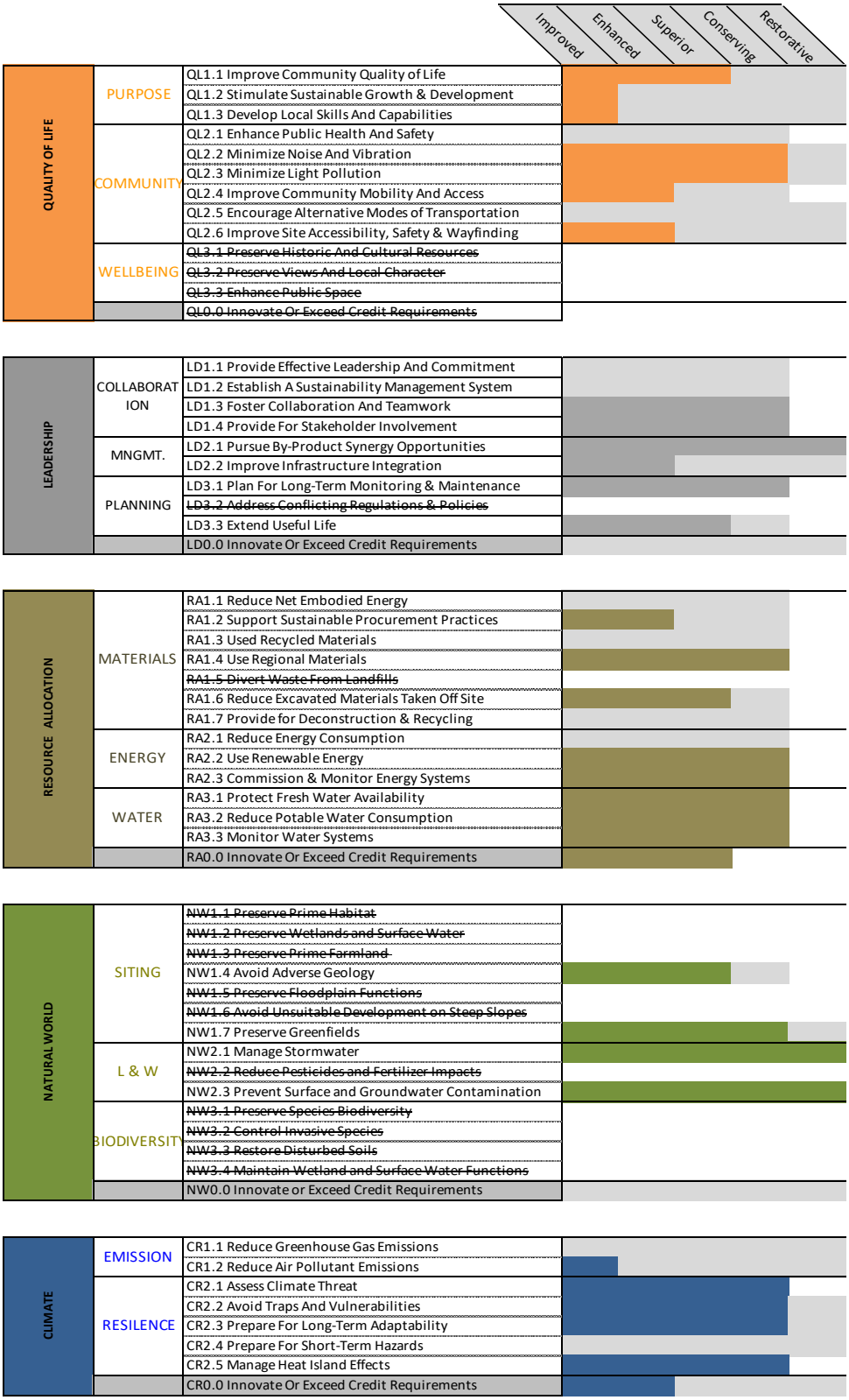
Figure 4: DGUP flow diagram/Photo from https://www.concreteconstruction.net/projects/infrastructure/sewer-agency-gets-2-million-check-for-producing-renewable-energy_o

Figure 5: 1 of 2 combustion turbine generators/Photo from LA Bureau of Sanitation

Figure 6: 1 of 2 heat recovery steam generators/Photo from LA Bureau of Sanitation

Figure 7: 1 of 2 steam turbine generators/Photo from LA Bureau of Sanitation

B: ENVISION POINTS TABLE



			Improved	Enhanced	Superior	Conserving	Restorative
QUALITY OF LIFE	PURPOSE	QL1.1 Improve Community Quality of Life					
		QL1.2 Stimulate Sustainable Growth & Development					
		QL1.3 Develop Local Skills And Capabilities					
	COMMUNITY	QL2.1 Enhance Public Health And Safety					
		QL2.2 Minimize Noise And Vibration					
		QL2.3 Minimize Light Pollution					
		QL2.4 Improve Community Mobility And Access					
		QL2.5 Encourage Alternative Modes of Transportation					
		QL2.6 Improve Site Accessibility, Safety & Wayfinding					
	WELLBEING	~~QL3.1 Preserve Historic And Cultural Resources~~					
		~~QL3.2 Preserve Views And Local Character~~					
		~~QL3.3 Enhance Public Space~~					
		~~QL0.0 Innovate Or Exceed Credit Requirements~~					
LEADERSHIP	COLLABORATION	LD1.1 Provide Effective Leadership And Commitment					
		LD1.2 Establish A Sustainability Management System					
		LD1.3 Foster Collaboration And Teamwork					
		LD1.4 Provide For Stakeholder Involvement					
	MNGMT.	LD2.1 Pursue By-Product Synergy Opportunities					
		LD2.2 Improve Infrastructure Integration					
	PLANNING	LD3.1 Plan For Long-Term Monitoring & Maintenance					
		~~LD3.2 Address Conflicting Regulations & Policies~~					
		LD3.3 Extend Useful Life					
		LD0.0 Innovate Or Exceed Credit Requirements					
RESOURCE ALLOCATION	MATERIALS	RA1.1 Reduce Net Embodied Energy					
		RA1.2 Support Sustainable Procurement Practices					
		RA1.3 Used Recycled Materials					
		RA1.4 Use Regional Materials					
		~~RA1.5 Divert Waste From Landfills~~					
		RA1.6 Reduce Excavated Materials Taken Off Site					
		RA1.7 Provide for Deconstruction & Recycling					
	ENERGY	RA2.1 Reduce Energy Consumption					
		RA2.2 Use Renewable Energy					
		RA2.3 Commission & Monitor Energy Systems					
	WATER	RA3.1 Protect Fresh Water Availability					
		RA3.2 Reduce Potable Water Consumption					
		RA3.3 Monitor Water Systems					
		RA0.0 Innovate Or Exceed Credit Requirements					
NATURAL WORLD	SITING	~~NW1.1 Preserve Prime Habitat~~					
		~~NW1.2 Preserve Wetlands and Surface Water~~					
		~~NW1.3 Preserve Prime Farmland~~					
		NW1.4 Avoid Adverse Geology					
		~~NW1.5 Preserve Floodplain Functions~~					
		~~NW1.6 Avoid Unsuitable Development on Steep Slopes~~					
		NW1.7 Preserve Greenfields					
	L & W	NW2.1 Manage Stormwater					
		~~NW2.2 Reduce Pesticides and Fertilizer Impacts~~					
		NW2.3 Prevent Surface and Groundwater Contamination					
	BIODIVERSITY	~~NW3.1 Preserve Species Biodiversity~~					
		~~NW3.2 Control Invasive Species~~					
		~~NW3.3 Restore Disturbed Soils~~					
		~~NW3.4 Maintain Wetland and Surface Water Functions~~					
		NW0.0 Innovate or Exceed Credit Requirements					
CLIMATE	EMISSION	CR1.1 Reduce Greenhouse Gas Emissions					
		CR1.2 Reduce Air Pollutant Emissions					
	RESILENCE	CR2.1 Assess Climate Threat					
		CR2.2 Avoid Traps And Vulnerabilities					
		CR2.3 Prepare For Long-Term Adaptability					
		CR2.4 Prepare For Short-Term Hazards					
		CR2.5 Manage Heat Island Effects					
		CR0.0 Innovate Or Exceed Credit Requirements					

POINTS ACHIEVED	337	**55.2%**
POINTS AVAILABLE	611	

C: GRAPHS

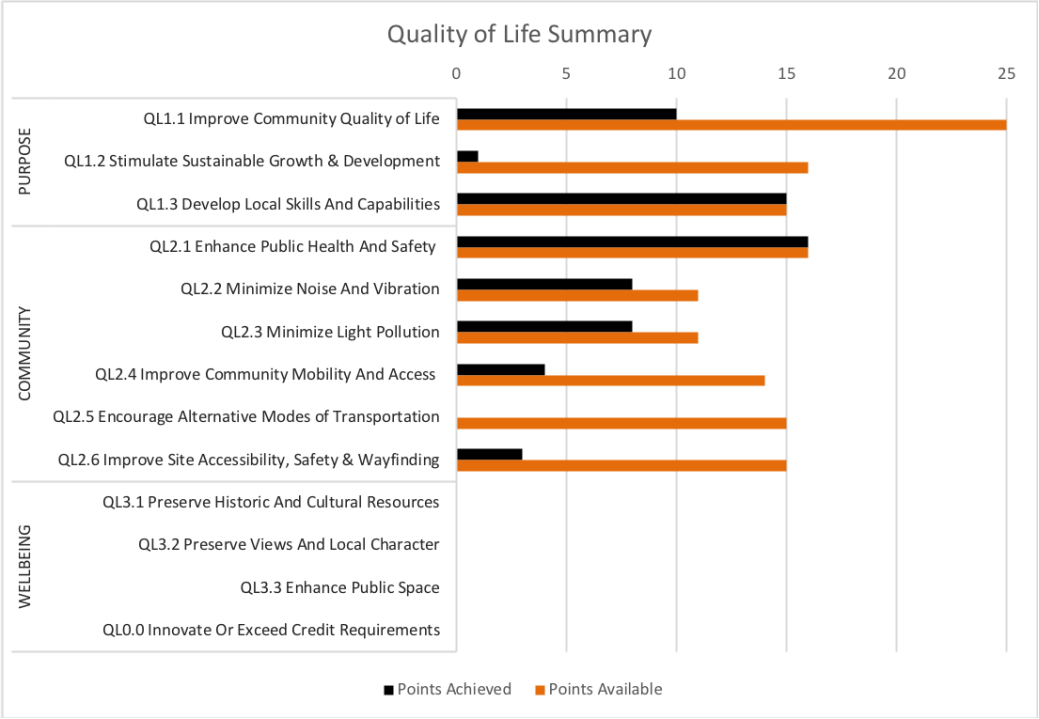


Figure 8: Quality of Life category summary of results

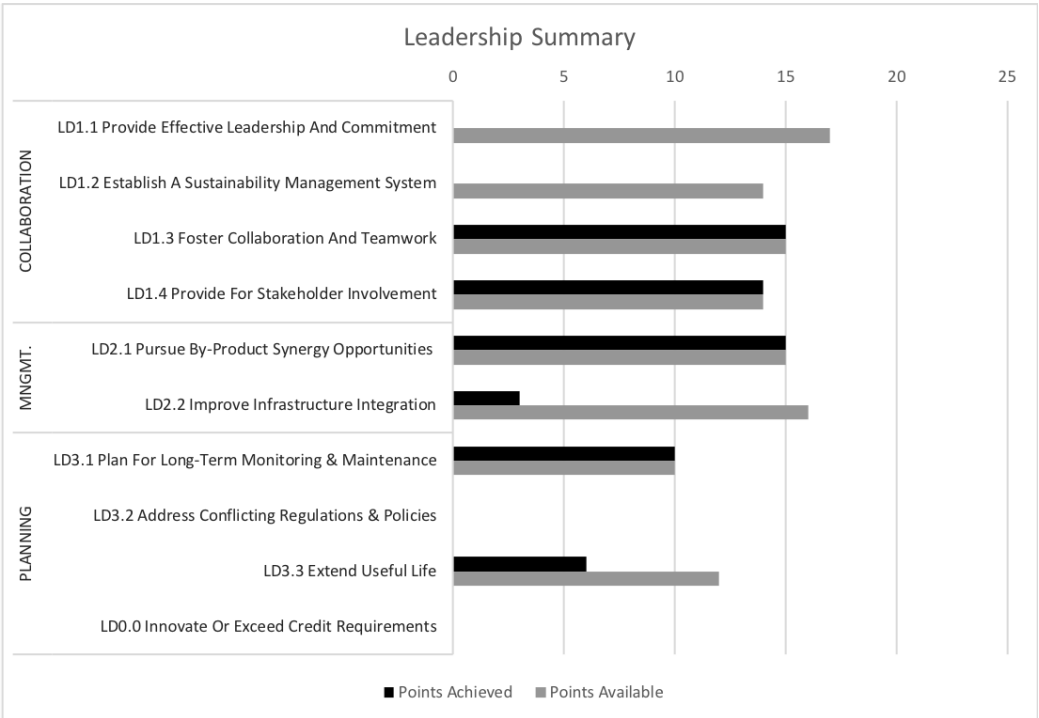


Figure 9: Leadership category summary of results

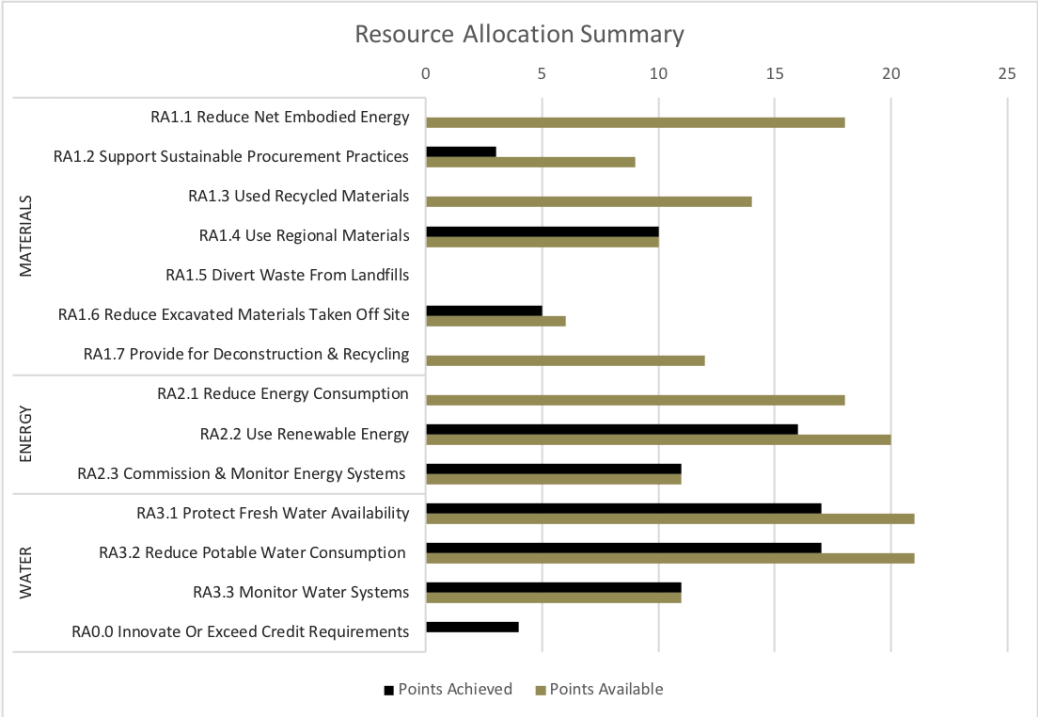


Figure 10:Resource Allocation category_ Summary of results

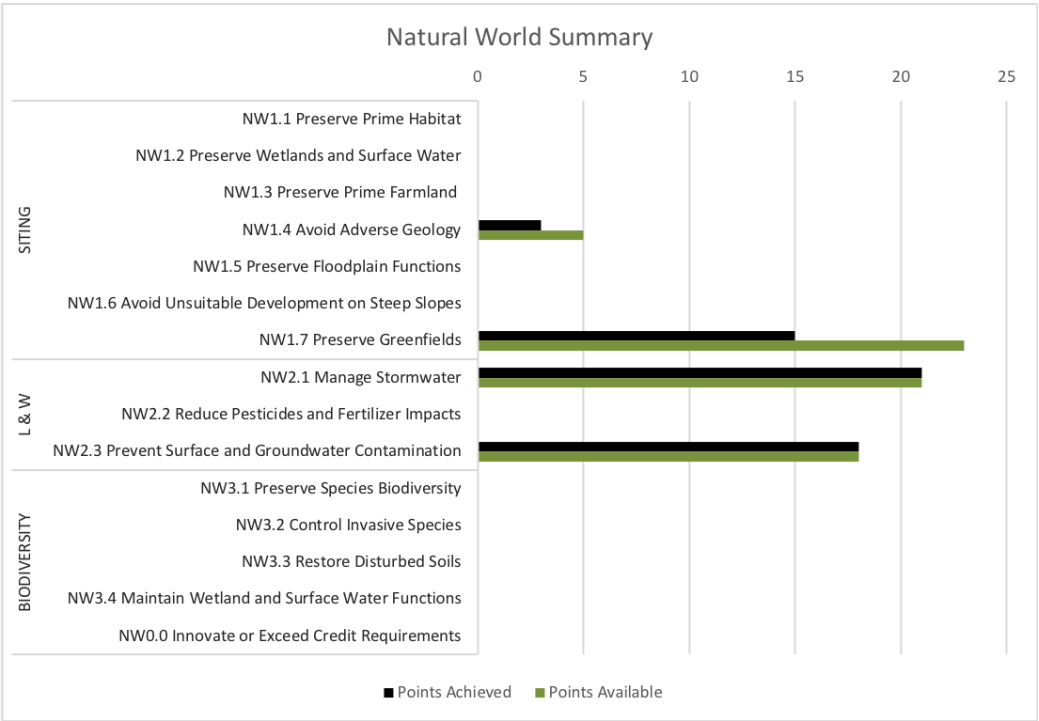


Figure 11: Natural World category summary of results

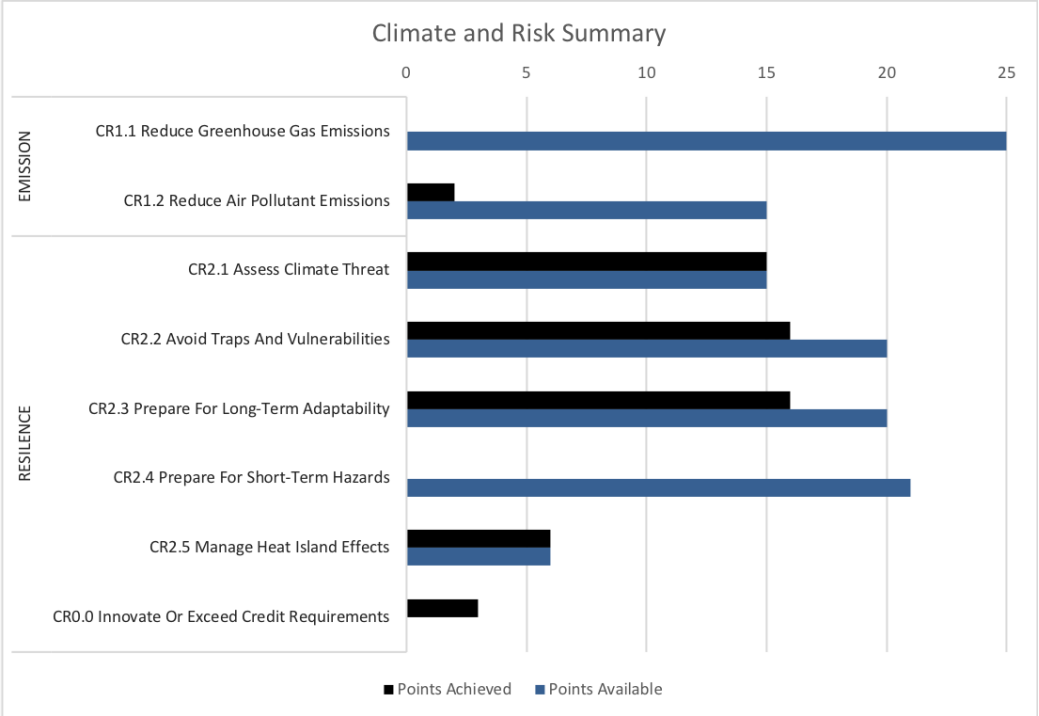


Figure 12: Climate & Risk category summary of results

D: SOURCES

DOCUMENTATION PROVIDED
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