

Permit Amendment Source Analysis & Technical Review

Company	TPC Group LLC	Permit Numbers	22052, PSDTX1578, N286, GHGPSDTX201, 46307, PSDTX1580, N288, GHGPSDTX202, 46426, PSDTX999M1, N290, GHGPSDTX203, 19806 and PSDTX1586
City	Houston	Project Numbers	312938, 312937, 312936, and 315541
County	Harris	Regulated Entity Number	RN100219526
Project Type	Amendment	Customer Reference Number	CN603624289
Project Reviewer	Cara Hill	Received Date	March 5, 2020 and May 5, 2020
Site Name	Houston Plant		

Project Overview

TPC Group LLC (TPC) owns and operates the Houston Plant, a petrochemical production plant in Houston, Harris County, Texas. TPC is requesting to amend several site permits to authorize a butadiene (BD) capacity increase and reliability improvement project (BD expansion). The BD expansion project will involve the construction of new units and modifications to existing units. Emissions sources include cooling towers, storage tanks, fugitive components, wastewater, railcar loading, boilers, and maintenance, startup, and shutdown (MSS) activities. TPC is submitting these amendment applications concurrently, and evaluating all new, modified, and affected sources under one Federal New Source Review (FNSR) Analysis and one Air Quality Analysis (AQA). Additionally, a separate project is included which is primarily to comply with the Compliance Assurance Plan (CAP) to address particulate matter compliance issues with the DH2 Heat Recovery Boilers (EPNs EB-1B-505 and 506) and other miscellaneous changes. No Permit by Rule (PBR) or Standard Permit (SP) requires incorporation during this permitting action. Maintenance, startup, and shutdown are located within these permits.

Emission Summary

Air Contaminant	Current Allowable Emission Rates (tpy)	Proposed Allowable Emission Rates (tpy)	Change in Allowable Emission Rates (tpy)	Project Changes at Major Sources (Baseline Actual to Allowable)*	Project Changes at Major Sources (Baseline Actual to Allowable)**
PM	105.19	203.19	98.00	56.90	26.42
PM ₁₀	102.96	200.71	97.75	56.90	25.34
PM _{2.5}	97.33	196.83	99.50	56.91	23.08
VOC	299.71	247.08	-52.63	4.74	36.66
NO _x	905.01	957.13	52.12	9.83	42.28
CO	974.28	754.32	-219.96	14.29	63.91
SO ₂	12.78	48.49	35.71	3.03	3.34
CO _{2e}	0.00	274,494	274,494	N/A	274,494

*Project changes associated with DH2 Heat Recovery Boiler project. See federal applicability section.

** Project changes associated with BD Expansion project. See federal applicability section.

Compliance History Evaluation - 30 TAC Chapter 60 Rules

A compliance history report was reviewed on:	March 12, 2020
Site rating & classification:	23.80 / Satisfactory
Company rating & classification:	17.59 / Satisfactory

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Has the permit changed on the basis of the compliance history or rating? No

Did the Regional Office have any comments? If so, explain. Yes, regional office relayed compliance history information

Public Notice Information

(22052, PSDTX1578, N286, GHGPSDTX201, 46307, PSDTX1580, N288, GHGPSDTX202, 46426, PSDTX999M1, N290, and GHGPSDTX203)

Requirement	Date
Legislator letters mailed	4/15/2020
Date 1 st notice published	5/6/2020
Publication Name: <i>Pasadena Citizen</i>	
Pollutants: carbon monoxide, hazardous air pollutants, nitrogen oxides, organic compounds, particulate matter including particulate matter with diameters of 10 microns or less and 2.5 microns or less, sulfur dioxide, and greenhouse gases	
Date 1 st notice Alternate Language published	5/3/2020
Publication Name (Alternate Language): <i>La Voz</i>	
1 st public notice tearsheet(s) received	5/13/2020
1 st public notice affidavit(s) received	5/13/2020
1 st public notice certification of sign posting/application availability received	6/17/2020
SB709 Notification mailed	4/29/2020 (re-notice 3/16/2021)
Date 2 nd notice published	5/12/2021
Publication Name: <i>Pasadena Citizen</i>	
Pollutants: carbon monoxide, organic compounds, nitrogen oxides, hazardous air pollutants, and sulfur dioxide, particulate matter including particulate matter with diameters of 10 microns or less and 2.5 microns or less.	
Date 2 nd notice published (Alternate Language)	5/16/2021
Publication Name (Alternate Language): <i>La Voz</i>	
2 nd public notice tearsheet(s) received	6/01/2021
2 nd public notice affidavit(s) received	6/01/2021
2 nd public notice certification of sign posting/application availability received	6/21/2021

Public Notice Information

(19806 and PSDTX1586)

Requirement	Date
Legislator letters mailed	5/19/2020
Date 1 st notice published	6/10/2020
Publication Name: <i>Pasadena Citizen</i>	
Pollutants: organic compounds and particulate matter including particulate matter with diameters of 10 microns or less	

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and 2.5 microns or less.	
Date 1 st notice Alternate Language published	6/14/2020
Publication Name (Alternate Language): <i>La Voz</i>	
1 st public notice tearsheet(s) received	6/26/2020
1 st public notice affidavit(s) received	6/26/2020
1 st public notice certification of sign posting/application availability received	7/29/2020
SB709 Notification mailed	5/19/2020 (re-notice 3/16/2021)
Date 2 nd notice published	5/12/2021
Publication Name: <i>Pasadena Citizen</i>	
Pollutants: carbon monoxide, organic compounds, nitrogen oxides, hazardous air pollutants, and sulfur dioxide, particulate matter including particulate matter with diameters of 10 microns or less and 2.5 microns or less.	
Date 2 nd notice published (Alternate Language)	5/16/2021
Publication Name (Alternate Language): <i>La Voz</i>	
2 nd public notice tearsheet(s) received	6/01/2021
2 nd public notice affidavit(s) received	6/01/2021
2 nd public notice certification of sign posting/application availability received	6/21/2021

Public Interest*

Number of comments received	45
Number of meeting requests received	3
Number of hearing requests received	1
Date meeting held	8/12/2021
Date response to comments filed with OCC	1/5/2022
Date of SOAH hearing	N/A**

*(totals are combined for 22052, PSDTX1578, N286, GHGPSDTX201, 46307, PSDTX1580, N288, GHGPSDTX202, 46426, PSDTX999M1, N290, GHGPSDTX203, 19806, and PSDTX1586).

**SOAH hearing was settled prior to it taking place.

Federal Rules Applicability

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Requirement	
Subject to NSPS?	Yes
Subparts A, Kb, Db, VV, VVA, & IIII	
Subject to NESHAP?	Yes
Subparts A & FF	
Subject to NESHAP (MACT) for source categories?	Yes
Subparts A, F, G, H, Y, FFFF, ZZZZ, & DDDDD	

Nonattainment review applicability:

The Houston Plant is located in an attainment area for at least one pollutant. The plant is a named source (chemical process plant), and has a potential to emit (PTE) in excess of 100 tpy for at least one pollutant. The plant is located in Harris County which is classified as serious non-attainment area for ozone and an attainment or unclassified area for all other criteria pollutants. The BD Expansion project will result in a significant net increase of VOC. Nonattainment NSR applies to VOC.

PSD review applicability:

The Houston Plant is located in an attainment area for at least one pollutant. The plant is a named source (chemical process plant), and has a potential to emit (PTE) in excess of 100 tpy for at least one pollutant. Prevention of Significant Deterioration (PSD) review applies, and PSD Air Quality Analysis (AQA) and Best Available Control Technology (BACT) requirements apply to the following pollutants for which the PTE exceeds an applicable significance threshold (40 CFR § 52.21(b)(23)(i)): PM, PM₁₀, PM_{2.5}. The PTE for NO_x, CO, and SO₂, is less than the applicable significance thresholds, and PSD AQA and BACT requirements do not apply for these pollutants. Instead, Minor New Source Review (NSR) AQA and BACT requirements apply. Finally, the plant has a PTE in excess of 100 tpy (mass basis) and 75,000 tpy GHG (CO₂e basis) for GHG. GHG are therefore subject to regulation (40 CFR § 52.21(b)(49)(iv)) and PSD BACT requirements apply to GHG.

Title V Applicability - 30 TAC Chapter 122 Rules

Requirement

Title V applicability:

The site is subject to the Title V program because it is a major source. The facility currently operates under Site Operating Permit No. O-1598.

Periodic Monitoring (PM) applicability:

Periodic Monitoring is applicable because the site is a major source. The following provisions within the scope of the amendment for monitoring are being included in the special conditions:

- Implementation of the 28LAER LDAR program for VOC fugitive emissions,
- Continuous monitoring of temperature for the thermal oxidizer,
- Monitoring of the cooling tower water VOC emissions,
- Monitoring of PM emissions from the cooling towers,
- Standard monitoring and recordkeeping of MSS activities and emissions
- CEMS for the boiler

Compliance Assurance Monitoring (CAM) applicability:

The site is subject to Title V permitting requirements. The flare and selective catalytic reduction (SCR) systems are control devices used to achieve compliance with an applicable requirement of the permit, and control emissions sources with a pre-control emission rate in excess of an applicable major source threshold. CAM for the flares is addressed by continuous flow and BTU monitoring. CAM for the SCR is addressed by ammonia slip monitoring and/or CEMS.

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Regulated Entity No. RN100219526

Process Description

The plant currently manufactures various light olefin products including butadiene, methyl-tert-butyl ether (MTBE), butenes, diisobutylene (DIB), isobutylene, and polyisobutylene (PIB). Production at the Houston Facility occurs through several units, including the Butadiene Unit, the Raffinate MTBE Unit, Butene-1 Unit, the DIB unit, and the PIB unit. Along with process units, the Houston Plant operates several associated utility sources including boilers and cooling towers.

The marine facility consists of A Dock and B Dock. Methyl-tert-butyl ether (MTBE), ethyl-tert-butyl-ether (ETBE), and diisobutylene (DIB) are loaded under atmospheric conditions into ships and barges. The dock vapor control system collects hydrocarbon vapors displaced during atmospheric loading operations and routes them to control. When certain operational conditions are met, both MTBE/ETBE and DIB can be loaded under vacuum to further reduce fugitive dockside emissions of hydrocarbons.

Butadiene, butylenes, mixed butadiene, raffinates, butanes, and propane are loaded/unloaded through pressurized systems. There are no emissions related to the loading/unloading operations of the pressurized system, with the exception of fugitive components.

Project Scope

TPC proposes to authorize a butadiene (BD) capacity increase and reliability improvement project (BD expansion). The BD expansion project will involve the construction of new units and modifications to existing units. Emissions sources include cooling towers, storage tanks, fugitive components, wastewater, railcar loading, boilers and maintenance, startup, and shutdown (MSS) activities.

Permit No. 22052 authorizes a marine terminal. New equipment to be authorized under NSR Permit No. 22052 includes fugitive components (EPN FUG-BD-D), a Raff pump and a thermal oxidizer (EPN DOCK-TO). The thermal oxidizer will replace the existing dock flare (EPN E-563) as the primary mode of control for products loaded at the docks. The flare will remain at the facility to be used for maintenance, start-up, and shutdown (MSS) purposes when the thermal oxidizer is offline. The flare will be operational for not more than 200 hours when the thermal oxidizer is down for maintenance. As part of this project, TPC also requests to update dock loading throughputs to the rates.

New equipment and activities required for the BD expansion under Permit No. 46307 include the following:

- Construct new towers, heat exchangers, condensate pots, centrifugal pumps and a holding drum for ETBE production;
- Construct new towers and a floating roof tank for the project;
- Debottleneck the vinyl acetylene (VAU) unit;
- Replace vent gas recovery system compressor;
- Reuse existing pressurized tank TK57 for furfural wash water storage;
- Improve reliability of system operations for the North Absorber;
- Install new pumps for anticipated pipeline business changes;
- Relocate PIB railcar loading to new spur;
- Reuse existing pressurized tank TK 8 to receive additional Raff;
- Authorize storage of IC8 in existing floating roof tank TK 115;
- Construct new pressurized tank for additional BD storage;
- Add Polygas production representation; and
- Authorize new fugitive components in support of all BD expansion activities.
- Increase marine loading throughputs and construct a thermal oxidizer, Raff pump, and fugitive components

TPC is requesting to amend NSR Permit No. 46426 to authorize the construction of one new boiler (Boiler 12) as well as the shutdown and decommissioning of an existing boiler (EPN EP-H9). The proposed project will take place in conjunction with the BD expansion project.

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TPC also requested to amend Permit No. 19806 in order to address particulate matter (PM) compliance issues with Boilers 505 and 506 (EPNs EP-1B-505 and EB-1B-506); to debottleneck the Dehydro 2 Unit (DH2) and other miscellaneous changes. TPC also requested to move a cooling tower from Permit No. 46307 to Permit No. 19806.

A summary of the draft permit changes, including control, monitoring, recordkeeping and reporting requirements, is given below.

Permit Nos. 22052, PSDTX1578, N286, GHGPSDTX201	
SC No.	Comment
1	Incorporates MAERT and limits scope of authorization to sources listed on MAERT.
2	Generic prohibition on releases from uncontrolled process vents, limits on permit holder's ability to claim affirmative defense under 30 TAC Chap. 101 for releases from pressure relief devices.
7	Required Leak Detection and Repair program.
9.B	Added thermal oxidizer requirements.
12.F	Limits on the hours of operation of the flare.
13-16	Operational requirements for thermal oxidizer
17	Stack sampling requirements for thermal oxidizer.
23-26	Offset requirements.
27-30	Greenhouse gas emissions recordkeeping requirements

Permit Nos. 46307, PSDTX1580, N288, GHGPSDTX202	
SC No.	Comment
23-25	Updates to cooling tower requirements.
32	Required Leak Detection and Repair program.
38	Authorization of planned MSS activities. Associated recordkeeping requirements
39-42	Control, monitoring and recordkeeping requirements for planned MSS activities, including degassing of process vessels and storage tanks; handling and removal of solids during plant turnarounds; vacuum truck operation; frac tank operation; and inherently low emitting activities. Approved analytical methods for demonstrating compliance with control requirements. Operational requirements for temporary control devices supporting planned MSS activities.
47-50	Offset requirements.
51-54	Greenhouse gas emissions recordkeeping requirements.

Permit Nos. 46426, PSDTX999M1, N290, GHGPSDTX203	
SC No.	Comment
1	Incorporates MAERT and limits scope of authorization to sources listed on MAERT.
2	Generic prohibition on releases from uncontrolled process vents, limits on permit holder's ability to claim affirmative defense under 30 TAC Chap. 101 for releases from pressure relief devices.
3-4	Incorporates applicable NSPS and NESHAP standards by reference.
5	Limits on fuel sulfur.
6-7	Limits for products of combustion (NO _x , CO) and ammonia slip for boilers.
10	Stack sampling requirements for the boiler.
11, 13-14	CEMS and fuel flow monitor installation, calibration and maintenance requirements for the boilers
17	Updates to recordkeeping requirements.
22-23	Updates to startup and shutdown requirements for the boilers.
24-27	Offset requirements.
28-31	Greenhouse gas emissions recordkeeping requirements.

Permit Nos. 19806 and PSDTX1586	
SC No.	Comment
17	Updated boiler references.

Permit Amendment

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25-26	Cooling tower requirements
27	Required Leak Detection and Repair program.
30	Startup requirements.

Best Available Control Technology

Permit No.	Source Name	EPN	Best Available Control Technology Description
22052	Marine Loading	DOCK-TO E-563 C-5	The applicant proposes 99.9% capture with vapor tightness tests and vapor collection connection pressure checks. Loading will be submerged. Captured emissions will be routed to the dock thermal oxidizer (EPN DOCK-TO).
22052	Dock Thermal Oxidizer	DOCK-TO	EPN DOCK-TO is a new thermal oxidizer to be authorized under Permit No. 22052. The dock thermal oxidizer will replace the existing dock flare (EPN E-563) as the primary control device for dock loading. The applicant proposes 99.9% DRE for the marine loading thermal oxidizer for LAER. This is to be demonstrated through initial stack sampling and by maintaining the firebox temperature at or above the temperature demonstrated during the stack test (6-minute average) during subsequent operations. Prior to the initial stack test, the firebox temperature must be maintained at or above 1400°F. Collateral NO _x emissions are limited to 0.02 lb/MMBtu, based on the higher heating value of the waste gas. Low sulfur fuel with 2000 grains of sulfur content per million scf will be used. Use of natural gas and good combustion practices will limit GHG.
22052	Dock Fugitives	FUG-BD-D	EPN FUG-BD-D are new fugitive components to be authorized under Permit No. 22052. 28LAER Leak Detection and Repair (LDAR) monitoring program is proposed to meet LAER.
22052	Marine Loading Flare	E-563	The flare will remain at the facility to be used for maintenance, start-up, and shutdown (MSS) purposes when the thermal oxidizer is offline. The flare will be operational for not more than 200 hours when the thermal oxidizer is down for maintenance.
46307	Process Vents	various	TPC proposes as LAER routing the vents to the fuel gas system (including the boilers authorized under NSR Permit No. 46426), which achieves a greater than 99.9% destruction efficiency. Routing to the fuel gas system will serve as the primary mode of control. When the fuel gas vapor recovery compressors are down, process vents are routed to a flare as back up control. The backup controls are expected to last no more than 200 hours per year, and the backup flare will meet all requirements of 40 CFR 60.18. The flare

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			has a 99% destruction efficiency for species with less than three carbon atoms and a 98% destruction efficiency for species with three or more carbon atoms.
46307	Storage tank	T-81	TPC is proposing LAER for EPNs T-81, T-82, and T-86 as fixed roof tanks painted white with submerged fill for all tanks containing material with a VOC partial vapor pressure of less than 0.1 psi.
46307	Storage tank	T-82	
46307	Storage tank	T-86	
46307	Internal Floating Roof Storage Tank	TK-2D6	Tank TK-2D6 will have operational flexibility to store MTBE, DIB, IC8, or ETBE; and Tank T-115 will store MTBE, IC8, or ETBE; all having vapor pressures greater than 0.1 psia. TPC proposes LAER as an internal floating roof tank with a vapor mounted primary seal and a secondary seal rim mounted.
46307	Internal Floating Roof Storage Tank	T-115	
46307	Cooling Tower	F-CT-10	VOC emissions from the cooling tower will result through non-contact liquid drift of the cooling water which contains VOC from the process. TPC is proposing LAER as being consistent with BAAQMD Regulation 11 Rule 10's guidance of 0.042 ppmw. Dissolved solids in the cooling water may also result in particulate emissions at the cooling tower. The permit requires that particulate emissions be minimized through the drift eliminators which are designed to limit total liquid drift to no greater than 0.0005%. Drift eliminators must be inspected regularly and must be repaired or replaced when defects are discovered.
46307	Fugitives	FUG-BD-V	28LAER Leak Detection and Repair (LDAR) monitoring program is proposed to meet LAER.
46307	MSS	MSS-BD	New equipment related to the BD expansion will result in vessel clearing MSS activities. The only new emissions associated with these sources will be once the vessels are opened to atmosphere (EPN MSS-BD), which will only occur once the vapor space of the vessels is at a VOC concentration of 500 ppmv or less. Additionally, this project will authorize MSS emissions from the floating roof tank (EPN TK-2D6), which will require degassing for maintenance activities to be performed, represented as EPN MSS-FLR. The only BACT or LAER requirements found in the LAER review comes from the TCEQ Tier I BACT for floating roof tanks. TPC proposes the TCEQ Tier I BACT requirements as LAER. During degassing and refilling, TPC will route vapors to a portable flare. Use of natural gas and good combustion practices will limit GHG in the portable flare.
46307	MSS	FLR	
46426	Boiler 12	Boiler 12	VOC emissions will be generated from the boilers as a product of combustion and un-combusted fuel gas.

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			<p>The proposed boiler will have a heat input of 664 MMBtu/hr and will be fired by natural gas and/or fuel gas. The boiler is also used to control VOC emissions from process vents that are routed to the fuel gas system, with a DRE of 99.99%. Process vents associated with new equipment are being authorized concurrently under Permit No. 46307. TPC proposes good combustion practices and will achieve a 99.99% DRE for VOC for process vents. A NO_x emission rate of 0.01 lb/MMBtu achieved through the use of low-NO_x burners and selective catalytic reduction (SCR) post-combustion controls. For CO emissions, 10 ppmv of CO at 3% O₂ through the use of oxidization catalyst. SO₂ emission factors are conservatively based on plant fuel gas which contains no more than 0.4 grains per 100 scf on an annual basis. Hourly SO₂ emissions are based on an even split between natural gas with 4 ppm of sulfur and DH2 Off-Gas with 160 ppm sulfur, resulting in a combined 82 ppm. A 10 ppmv at 3% O₂ concentration of NH₃ slip will be achieved through proper control of the SCR ammonia injection system. Use of gaseous fuel and good combustion practices will limit GHG.</p>
19806	DH2 Heat Recovery Boiler	EB-1B-505	<p>The heat recovery boiler (EPN EB-1B-505) is used at the DH2 Unit to provide steam and heat recovery by firing a mix of natural gas and fuel gas. Each boiler is equipped with low-NO_x burners and selective catalytic reduction (SCR). Emissions from the DH2 Recovery Boiler (FIN 1B-505), the DH2 Air Heater (FIN 1B-2502), the DH2 Reactors (FIN 1F-501 through 507), and the DH2 Regen Gas Heater (FIN IG-2520) all contribute to emissions from EPN EB-1B-505. TPC proposes as BACT for the heat recover boilers to utilize TCEQ Tier I BACT with the selection of primary fuel with inherently low PM emissions as well as good combustion practices and proper unit design. Additionally, TPC will meet the 5% opacity requirement for the boilers.</p>
19806	DH2 Heat Recovery Boiler	EB-1B-506	<p>The heat recovery boiler (EPN EB-1B-506) is used at the DH2 Unit to provide steam and heat recovery by fueling a mix of natural gas and fuel gas. The boiler is equipped with low-NO_x burners and selective catalytic reduction (SCR). Emissions from the the Dehydro No. 2 Heat Recovery Boiler (FIN 1B-506) and the Dehydro No. 2 Regen Gas Generator (FIN 1G-901T) contribute to emissions from EPN EB-1B-506. TPC proposes as BACT for the heat recover boilers to utilize TCEQ Tier I BACT with the selection of primary fuel with inherently low PM emissions as well as good combustion practices and proper unit design. Additionally, TPC will meet the 5% opacity requirement for the boilers.</p>

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19806	Fugitive Components	F-20	28LAER Leak Detection and Repair (LDAR) monitoring program
19806	Cooling Tower	F-CT-3	VOC emissions from the cooling tower will result through non-contact liquid drift of the cooling water which contains VOC from the process. TPC is proposing BACT of 0.08 ppmw. Dissolved solids in the cooling water may also result in particulate emissions at the cooling tower. The permit requires that particulate emissions be minimized through the drift eliminators which are designed to limit total liquid drift to no greater than 0.0005%. Drift eliminators must be inspected regularly and must be repaired or replaced when defects are discovered

Permits Incorporation

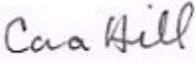
Permit by Rule (PBR) / Standard Permit / Permit Nos.	Description (include affected EPNs)	Action (Reference / Consolidate / Void)
N/A	N/A	N/A

Impacts Evaluation

Was modeling conducted? Yes	Type of Modeling: AERMOD
Is the site within 3,000 feet of any school?	No
Additional site/land use information:	

Air dispersion modeling was performed by the applicant to evaluate total air emissions from the proposed projects. Based on the results of the dispersion model, emissions from the site are not expected to result in a violation of any state or national ambient air quality standard, or a violation of any PSD increment. Emissions of non-criteria air contaminants are not expected to create adverse impacts to public health.

The air dispersion modeling demonstration was audited by the TCEQ Air Dispersion Modeling Team and approved in memos dated January 25, 2021 (WCC Content ID 5530081) and February 5, 2021 (WCC Content ID 5512489). A detailed description of the air dispersion modeling performed is contained in the Preliminary Determination Summary

		
6/10/2022	6/10/2022	
Project Reviewer Cara Hill	Date	Team Leader Joel Stanford
	Date	Date