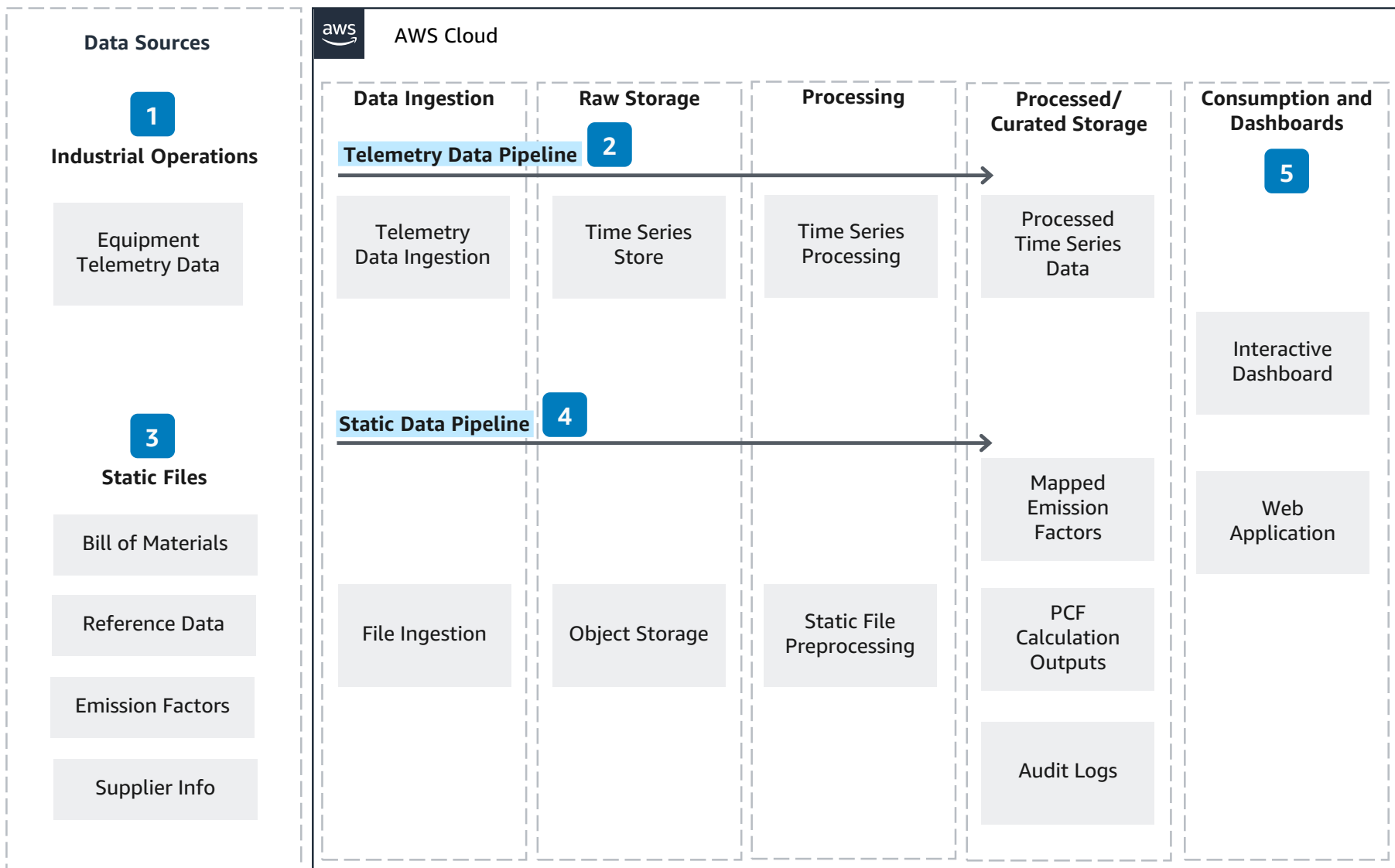


# Guidance for Product Carbon Footprinting on AWS

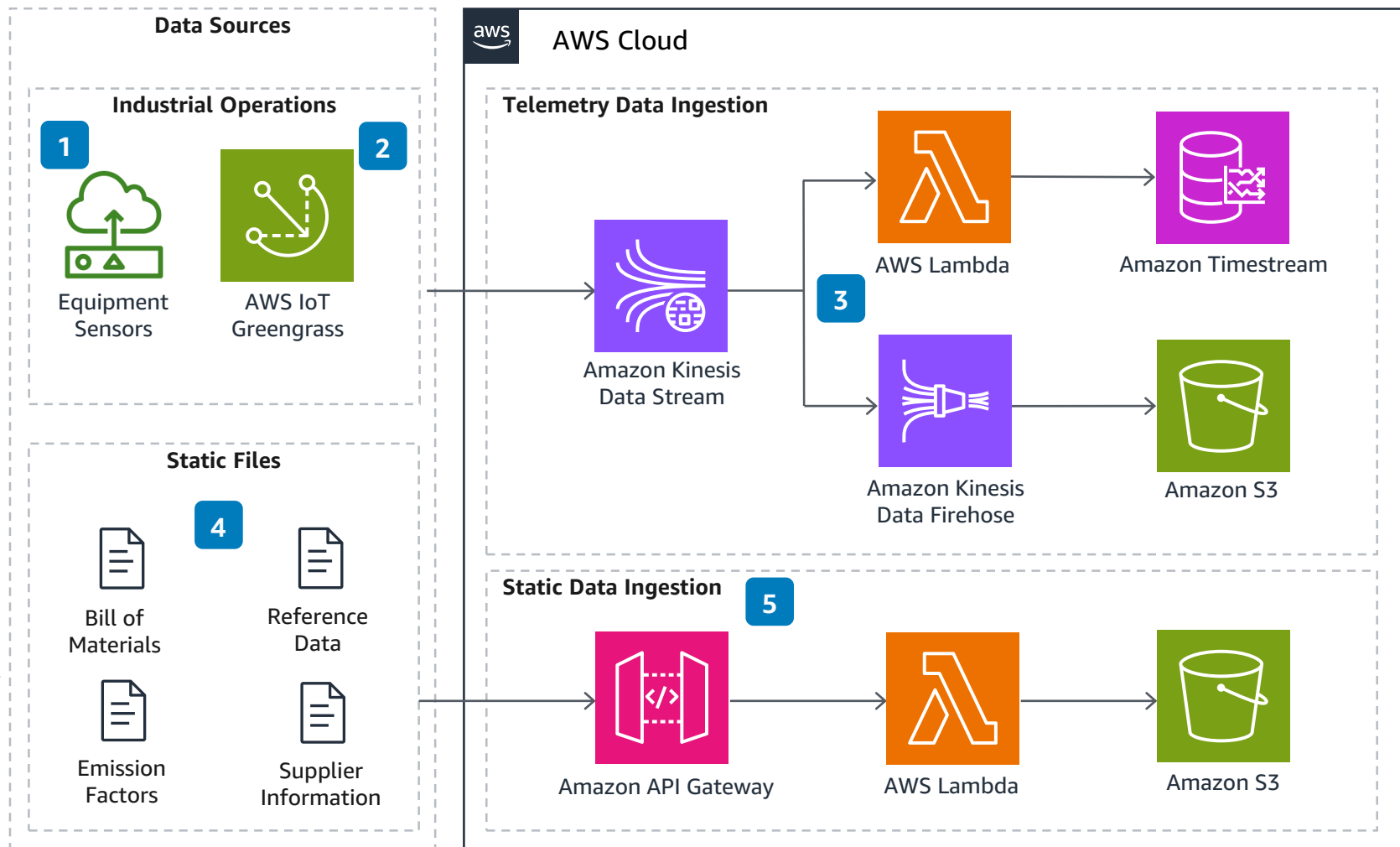
This architecture helps you automate a dynamic calculation of PCF, get up-to-date insights on product sustainability performance, and identify improvement opportunities.



- 1 Telemetry data, such as utility consumption and production metrics, are collected from sensors deployed at the industrial equipment.
- 2 Telemetry data is ingested to the cloud and processed.
- 3 Sustainability subject matter experts (SMEs) generate static files for bill of materials, reference data, emission factors, and supplier information.
- 4 The files are ingested and processed into mapped emission factors and combined with telemetry data for PCF calculations. An audit trail of the PCF calculation is stored in an audit log.
- 5 An interactive dashboard or a web application can combine and visualize the processed data to provide stakeholders with valuable insights.



# Data Sources and Ingestion



1 Sensors collect measurements of electricity and natural gas usage for the PCF analysis.

2 **AWS IoT Greengrass** collects, aggregates, and filters sensor readings. **AWS IoT Greengrass Stream Manager** exports the telemetry data to **Amazon Kinesis Data Streams**.

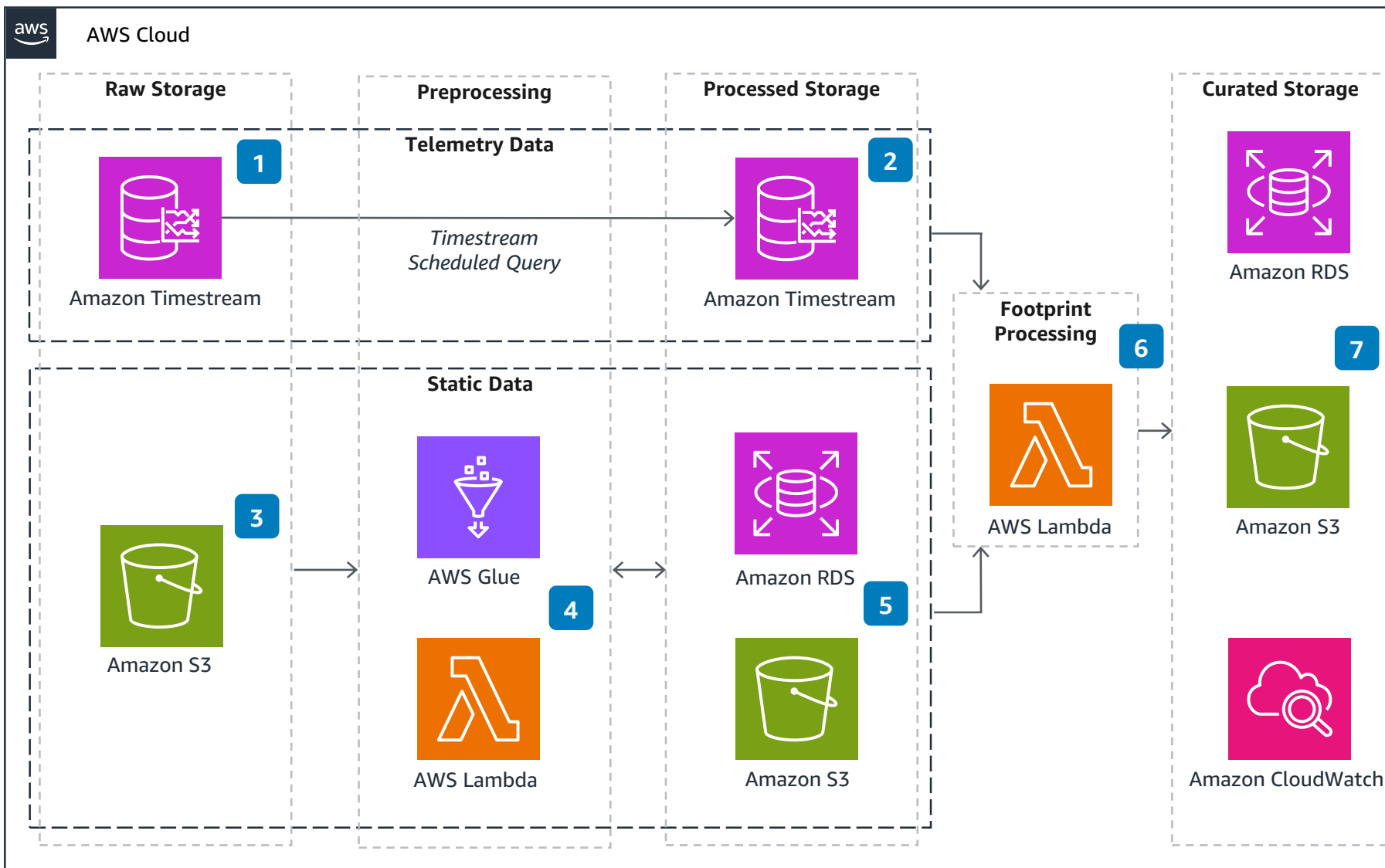
3 **Kinesis Data Streams** allows for high-throughput ingestion of telemetry data. An **AWS Lambda** function consumes the stream and loads telemetry data into **Amazon Timestream**. **Amazon Kinesis Data Firehose** loads the telemetry data into **Amazon Simple Storage Service (Amazon S3)**.

4 Sustainability SMEs collect static files for bill of materials, reference data, emission factors, and supplier information.

5 These static files are ingested to **Amazon S3** through a REST API endpoint exposed by **Amazon API Gateway** and backed by **Lambda**.



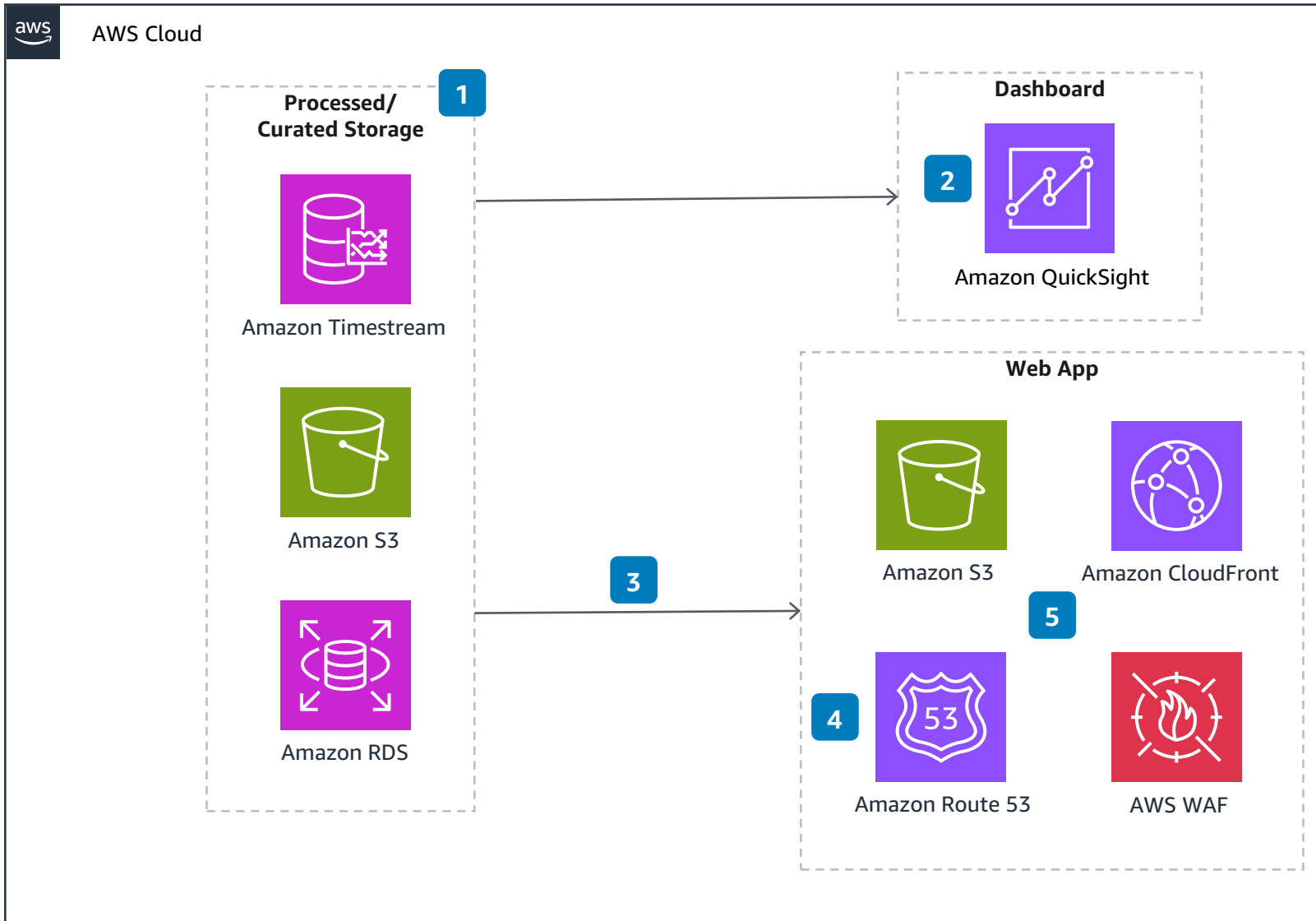
# Storage and Processing



- 1 **Timestream** stores raw telemetry data as hot storage.
- 2 A **Timestream** scheduled query aggregates the telemetry data to the maximum granularity required by downstream consumers and stores it in a new table.
- 3 Raw static files are stored in an **Amazon S3** bucket.
- 4 **Lambda** functions and **AWS Glue** read the static files from the raw **S3** bucket and transform them into structured data within the processed storage tier. This processing step includes a set of precomputations, such as the mapped emission factors for emission sources and raw materials and electricity for a specific factory based on the grid mix.
- 5 The processed static data is loaded into **Amazon Relational Database Service (Amazon RDS)** and the data lake powered by **Amazon S3**. This provides long-term storage and fast query access for downstream calculations.
- 6 A **Lambda** function reads emission factors and bill of materials data from **Amazon RDS** and electricity consumption data from **Timestream**. It performs carbon footprint calculations and stores the results and audit logs in the curated data tier.
- 7 The processed and curated storage tiers store the PCFs in **Amazon RDS** and **Amazon S3** for flexible access and long-term storage. **Amazon CloudWatch** stores audit logs.



# Consumption and Dashboard



- 1** Timestream, Amazon RDS, and Amazon S3 store data available for consumption.
- 2** Amazon QuickSight builds interactive dashboards to help executives, sustainability SMEs, and operations personnel analyze the PCF data, including on-the-fly PCF calculations. It can also pull precomputed PCF values for known queries ahead of time.
- 3** Based on the consumption patterns and type of business insights, executives, sustainability SMEs, and operations personnel may need a custom web application. This web application can pull precomputed PCF values from Amazon RDS or perform ad-hoc calculations as the user requests them.
- 4** Amazon Route 53, the domain name system (DNS), enables front-end clients to resolve the website hostname to the AWS content delivery network, Amazon CloudFront.
- 5** CloudFront routes the web requests to origin servers and caches the static content and assets served from Amazon S3 and origin servers. It secures the application traffic using AWS WAF, a web application firewall that helps to protect the application against common exploits and bots.

