BOOST Data Standard

W3C Community Group Final Specification

Version 2.8.0

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Abstract

The Biomass Open-Source Traceability (BOOST) data standard defines a comprehensive, interoperable framework for tracking biomass materials through complex supply chains. BOOST enables transparent, verifiable, and consistent data exchange to support sustainability verification, regulatory compliance, and supply chain integrity across the biomass economy. The standard implements a TraceableUnit (TRU)-centric model supporting media-interruption-free tracking, multi-species composition management, and comprehensive plant part categorization across 33 interconnected entities organized into 7 thematic areas.

Status of This Document

This specification was published by the Biomass Open Origin Standard for Tracking (BOOST) W3C Community Group (https://www.w3.org/community/boost-01/). It is not a W3C Standard nor is it on the W3C Standards Track. Please note that under the W3C Community Final Specification Agreement (FSA) other conditions apply. Learn more about W3C Community and Business Groups at https://www.w3.org/community/.

This document is governed by the W3C Community License Agreement (CLA). A human-readable summary is available at https://www.w3.org/community/about/process/cla-deed/.

Publication as a Community Group Report does not imply endorsement by the W3C Membership. This is a draft document and may be updated, replaced or obsoleted by other documents at any time. It is inappropriate to cite this document as other than work in progress.

How to Give Feedback

This specification is primarily developed on GitHub (https://github.com/carbondirect/BOOST). The best way to contribute to this specification is to:

1. File issues and suggestions in the BOOST GitHub repository (https://github.com/carbondirect/BOOST/issues)
2. Submit pull requests for specific changes
3. Participate in community discussions via GitHub Discussions (https://github.com/carbondirect/BOOST/discussions)

4. Join the W3C Community Group mailing list (https://lists.w3.org/Archives/Public/public-boost-01/) for broader discussions

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1 Introduction

The Biomass Open-Source Traceability (BOOST) data standard defines a comprehensive, interoperable framework for tracking biomass materials through complex supply chains. BOOST enables transparent, verifiable, and consistent data exchange to support sustainability verification, regulatory compliance, and supply chain integrity across the biomass economy.

1.0.1 Community Development Process

BOOST is developed through the BOOST W3C Community Group with collaborative input from industry stakeholders, regulatory agencies, and technical experts. The standard implements a `TraceableUnit`-centric model supporting media-interruption-free tracking, multi-species composition management, and comprehensive plant part categorization across 33 interconnected entities.

Working Group Leadership

- **Chair:** Peter Tittmann (Carbon Direct)
- **Technical Contributors:** Industry partners, certification bodies, and regulatory agencies
- **Community Participants:** 15+ active members from across the biomass supply chain

1.0.2 Current Development Status

Current Version Information

Current Version: v2.8.0 - Integrated ERD Navigator + Bikeshed Documentation System
Recent Enhancements:

- Consolidated documentation architecture with ERD Navigator integration
- Complete Resources & Community section with presentations and meetings
- Enhanced entity cross-references and interactive navigation
- Migrated all ReSpec content to unified Bikeshed system while preserving ERD functionality
- Interactive ERD Navigator with 33 entities across 7 thematic areas

1.0.3 Participation and Feedback

How to Contribute

- **GitHub Repository:** https://github.com/carbondirect/BOOST
- **Issues and Feedback:** Submit via GitHub Issues for technical discussions
- **Community Group:** Join the BOOST W3C Community Group
- **Interactive Tools:** Use the ERD Navigator to explore and provide schema feedback

Meeting Schedule: Regular working group meetings with notes and action items published via GitHub

1.1 Purpose and Scope

This specification defines the BOOST (Biomass Open-Source Traceability) data standard for biomass supply chain tracking and verification. The standard

provides:

- A unified data model for biomass custody transfers
- Format constraints for serializing chain of custody data
- Integration specifications for certification systems
- Regulatory compliance frameworks for multiple jurisdictions

1.2 Background and Motivation

The development of comprehensive biomass traceability systems addresses critical needs for sustainability verification, regulatory compliance, and supply chain transparency in the growing biomass economy. This standard enables interoperability between reporting systems, registries, and certification bodies.

Funding and Jurisdictional Context

The initial version of this data standard is funded through a grant from the California Department of Conservation, with an initial focus on California as the jurisdictional context while maintaining broad applicability to generalized biomass chain of custody requirements.

1.3 Relationship to Existing Standards

BOOST builds upon and integrates with established standards including:

- ISO 38200 [6] Chain of custody of wood and wood-based products
- SBP Standard 4 [7] and SBP Standard 5 [8] from Sustainable Biomass Partnership
- FSC-STD-40-004 [9] Forest Stewardship Council certification standards
- PEFC-ST-2002 [10] Programme for Endorsement of Forest Certification standards
- California LCFS [11] Low Carbon Fuel Standard requirements
- EU RED II [12] European Union Renewable Energy Directive II

1.4 Community Group Process

This specification was developed through the W3C Community Group process with balanced stakeholder participation including civil society organizations, government agencies, small and large businesses, and independent technical experts. Recruitment and engagement efforts were made to avoid overrepresentation of any single stakeholder group.

W3C Community Group Process

The group operates under the Community and Business Group Process, seeking organizational licensing commitments under the W3C Community Contributor License Agreement (CLA) for all substantive contributions.

2 Conformance

This section describes the conformance requirements for BOOST implementations. The key words "**must**", "**must not**", "**required**", "**shall**", "**shall not**", "**should**", "**should not**", "**recommended**", "**not recommended**", "**may**", and "**optional**" in this document are to be interpreted as described in RFC 2119 [1] and RFC 8174 [2] when, and only when, they appear in all capitals, as shown here.

RFC 2119 Keyword Interpretation

All RFC 2119 keywords in this specification are formatted using the standard conventions and carry the normative meanings defined in RFC 2119 and RFC 8174.

3 BOOST Traceability System

The BOOST Traceability System implements a revolutionary approach to biomass supply chain tracking that eliminates the traditional weak points where traceability is lost during material transfers and processing operations.

3.1 Key Implementation Features

3.1.1 Media-Interruption-Free Traceability

Revolutionary Traceability Approach

`TraceableUnit` entities maintain continuous identification through biometric signatures and optical pattern recognition, eliminating dependency on physical tags or attachments that can be lost or damaged during handling and processing operations.

3.1.2 Three Critical Tracking Points

The system establishes standardized measurement and verification infrastructure at:

- `harvest_site` - Initial TRU creation with biometric capture and volume measurement
- `skid_road/forest_road` - Transportation consolidation points with reconciliation validation
- `mill_entrance` - Processing facility entry points with final verification before transformation

Critical Tracking Point Requirements

Implementations **must** support measurement and verification at all three critical tracking points to ensure complete traceability chain integrity.

3.1.3 Multi-Species Support

Species-specific tracking capabilities enable:

- Individual species identification within mixed material flows
- Species-specific sustainability claim application and inheritance
- Detailed composition tracking with percentage validation
- Regulatory compliance for jurisdiction-specific species requirements

Species Composition Validation

SpeciesComponent entities provide detailed composition tracking with automatic percentage validation to ensure accuracy in multi-species materials.

3.1.4 Complete Processing Chain Documentation

MaterialProcessing entities provide comprehensive audit trails by:

- Linking input TRUs to output TRUs for every transformation
- Tracking plant part changes and transformations during processing
- Validating volume and mass conservation across processing steps
- Supporting split and merge operations with complete genealogy tracking

Processing Chain Requirements

All material transformations **must** be documented through `MaterialProcessing` entities that maintain complete input-to-output traceability with validated volume and mass conservation.

4 Data Model Architecture

The BOOST data model provides a comprehensive framework for representing all aspects of biomass supply chain operations. The model consists of 33 interconnected entities that work together to provide complete traceability from forest to final product.

4.1 Key Features

4.1.1 Comprehensive Entity System

Complete Data Model Coverage

- **33 Interconnected Entities** - Complete data model covering all aspects of biomass supply chains across 7 thematic areas
- **JSON-LD Validation** - Structured schemas with business rules and examples
- **Interactive ERD Navigator** - Dynamic exploration with GitHub discussion integration
- **Sustainability Claims** - Species-specific claims with inheritance through processing

4.1.2 Enhanced Geographic Integration

Spatial Data Management

- **GeoJSON Compliance** - Spatial data support for all location-aware entities
- **California Agency Ready** - Administrative boundary and jurisdiction tracking
- **Supply Base Management** - Infrastructure mapping with harvest sites and transportation routes

The data model implements a hub-and-spoke architecture with `TraceableUnit` as the central hub. All other entities **must** maintain direct or indirect relationships to TRUs to ensure complete traceability.

4.2 Entity Organization by Thematic Areas

The 33 BOOST entities are organized into 7 thematic areas (see Table 1):

Table 1: BOOST Entity Organization by Thematic Areas

Thematic Area	Description	Count
Core Traceability	Central tracking infrastructure	5
Organizational Foundation	Business entities and certifications	6
Material & Supply Chain	Material definitions and supply management	7
Transaction Management	Business transaction processing	3
Measurement & Verification	Measurement records and claims	4
Geographic & Tracking	Spatial data and location services	2
Compliance & Reporting	Analytics, reporting, and regulatory compliance	6
Total		**33**

Entity Relationship Requirements

All entities **must** follow the hub-and-spoke design pattern with direct or indirect relationships to `TraceableUnit` entities to maintain complete traceability chain integrity.

4.3 Foreign Key Conventions

All foreign key relationships **must** follow the EntityNameId pattern:

- Field names **must** end with "Id"
- Field names **must** reference the target entity name in PascalCase
- Examples: `OrganizationId`, `TraceableUnitId`, `GeographicDataId`

Foreign Key Naming Convention

Implementations **must** validate that all foreign key field names follow the EntityNameId pattern to ensure consistent referential integrity across the data model.

5 Plant Part Categorization System

5.1 Standardized Plant Parts Taxonomy

Implementations **must** support the following 17 standardized plant parts:

- `trunk` - Main stem/bole of tree
- `heartwood` - Inner, non-living wood
- `sapwood` - Outer, living wood
- `bark` - Protective outer layer
- `branches` - Secondary stems
- `leaves` - Photosynthetic organs
- `seeds` - Reproductive structures
- `roots` - Below-ground structures
- `twigs` - Small branches
- `cones` - Seed-bearing structures
- `needles` - Coniferous leaves
- `foliage` - All leaf matter
- `crown` - Above-ground branching structure
- `stump` - Remaining base after felling
- `chips` - Mechanically processed fragments
- `sawdust` - Fine processing residue
- `pellets` - Densified processed material

Plant Part Classification Requirements

All `TraceableUnit` entities **must** specify plant part classification using this standardized taxonomy to ensure consistent categorization across implementations.

6 Complete Entity Definitions

6.0.1 Traceable Unit

Unique biomass tracking unit with BOOST traceability system integration

Entity Relationships

This entity references the following entities:

- `operatorId` → `Operator` (Foreign key to operator)

** [View Traceable Unit in ERD Navigator](erd-navigator/index.html?focus=TraceableUnit)**

Table 2: Entity Definition: Traceable Unit

Field	Type	Description
createdTimestamp	string (date-time)	When the TRU was created
harvestGeographicDataId	string	Harvest location - uses Entity-NameId convention referencing GeographicData
harvesterId	string (pattern)	Foreign key to harvesting organization
isMultiSpecies	boolean	True if contains multiple species
materialTypeId	string	Foreign key to Material entity (reference table)
totalVolumeM3	number ($\geq$0)	Total volume of the traceable unit in cubic meters
traceableUnitId	string	Unique ID for each TRU
uniqueIdentifier	string	Biometric signature, RFID tag, or QR code
unitType	enum(4 values)	Type of traceable unit
assortmentType	enum(4 values)	Type of wood assortment
attachedInformation	array<string>	All data linked to this TRU
childTraceableUnitIds	array<string>	For split/merge operations (Phase 2)
currentGeographicDataId	string	Current location - uses Entity-NameId convention referencing GeographicData
currentStatus	enum(4 values)	Current status of the TRU (Phase 2)
lastUpdated	string (date-time)	Timestamp of the most recent data update
mediaBreakFlags	array<string>	Points where data continuity was lost (Phase 2)
operatorId	string	Foreign key to operator
parentTraceableUnitId	string	For split/merge operations (Phase 2)
processingHistory	array<string>	Complete processing chain references (Phase 2)
qualityGrade	enum(5 values)	Quality grade classification
sustainabilityCertification	string	FSC, PEFC, etc. claims (Phase 2)

6.0.2 Material Processing

Processing operations that transform TRUs with plant part tracking

Entity Relationships

This entity references the following entities:

- `operatorId` → `Operator` ()

** [View Material Processing in ERD Navigator](erd-navigator/index.html?focus=MaterialProces

Table 3: Entity Definition: Material Processing

Field	Type	Description
`inputTraceableUnitId`	string	No description provided
`inputVolume`	number (≥0)	No description provided
`outputTraceableUnitId`	string	No description provided
`outputVolume`	number (≥0)	No description provided
`processTimestamp`	string (date-time)	No description provided
`processType`	enum(6 values)	No description provided
`processingId`	string	No description provided
`equipmentUsed`	string	No description provided
`inputComposition`	string	No description provided
`inputPlantParts`	object	Plant parts in input TRU before processing
`operatorId`	string	No description provided
`outputComposition`	string	No description provided
`outputPlantParts`	object	Plant parts in output TRU after processing
`plantPartLosses`	object	Volume losses by plant part during processing
`plantPartTransformations`	array<object>	Specific plant part transformations during processing
`processingGeographicDataId`	string	No description provided
`qualityMetrics`	string	No description provided
`volumeLoss`	number (≥0)	No description provided

6.0.3 Processing History

Complete timeline of processing events with moisture tracking

Entity Relationships

This entity references the following entities:

- `operatorId` → `Operator` (Foreign key to operator who performed processing)

** [View Processing History in ERD Navigator](erd-navigator/index.html?focus=ProcessingHisto

Table 4: Entity Definition: Processing History

Field	Type	Description
inputTRUIds	array<string>	Array of input TRU IDs (multiple for merge operations)
materialProcessingId	string	Foreign key to MaterialProcessing operation
outputTRUIds	array<string>	Array of output TRU IDs (multiple for split operations)
processSequenceNumber	integer	Sequential order of this processing step for the TRU
processingEventType	enum(7 values)	Type of processing event
processingHistoryId	string	Unique identifier for the processing history record
timestamp	string (date-time)	When this processing step occurred
traceableUnitId	string	Foreign key to TRU this history record belongs to
claimInheritanceData	object (structured)	Sustainability claim inheritance tracking
equipmentUsed	string	Equipment used for this processing step
isCurrentProcessingState	boolean	True if this represents the current processing state
mediaBreakData	object (structured)	Media break detection and recovery information
nextProcessingHistoryIds	array<string>	Array of next processing history record IDs (for split operations)
operatorId	string	Foreign key to operator who performed processing
plantPartTransformation	string	Summary of plant part changes during processing
previousProcessingHistoryId	['string', 'null']	Foreign key to previous processing history record (forms chain)
processingDuration	string (pattern)	ISO 8601 duration format for processing time
processingGeographicDataId	string	Foreign key to location where processing occurred
qualityChangeDescription	string	Description of quality changes during processing
speciesCompositionChange	enum(5 values)	How species composition changed during processing
volumeChangeRatio	number ($\geq$0, 2.0)	Ratio of output volume to input volume (1.0 = no change)
volumeConservationData	object (structured)	Volume conservation validation data

6.0.4 Location History

Historical movement records of TRUs

Entity Relationships

This entity references the following entities:

- `operatorId` → `Operator` ()

** [View Location History in ERD Navigator](erd-navigator/index.html?focus=LocationHistory)*

Table 5: Entity Definition: Location History

Field	Type	Description
`geographicDataId`	string	No description provided
`isCurrentLocation`	boolean	No description provided
`locationEventType`	enum(5 values)	No description provided
`locationHistoryId`	string	No description provided
`timestamp`	string (date-time)	No description provided
`traceableUnitId`	string	No description provided
`distanceTraveled`	number (≥0)	No description provided
`equipmentUsed`	string	No description provided
`lastUpdated`	string (date-time)	No description provided
`materialProcessingId`	['string', 'null']	No description provided
`notes`	string	No description provided
`operatorId`	string	No description provided
`transportMethod`	enum(5 values)	No description provided
`verificationMethods`	array<string>	No description provided

6.0.5 Biometric Identifier

BiometricIdentifier entity in BOOST data model

** [View Biometric Identifier in ERD Navigator](erd-navigator/index.html?focus=BiometricIdenti

Table 6: Entity Definition: Biometric Identifier

Field	Type	Description
biometricId	string	No description provided
biometricSignature	string	No description provided
captureMethod	enum(optical_scanner, photo_analysis)	No description provided
captureTimestamp	string (date-time)	No description provided
traceableUnitId	string	No description provided
captureGeographicDataId	string	No description provided
speciesBiometrics	array<string>	No description provided
trackingPointId	string	No description provided

6.0.6 Organization

Organization entity with geographic data references and certification management capabilities for Phase 2 BOOST traceability system enhancements

Entity Relationships

This entity references the following entities:

- `organizationId` → `Organization` (Unique identifier for the organization)

** [View Organization in ERD Navigator](erd-navigator/index.html?focus=Organization)**

Table 7: Entity Definition: Organization

Field	Type	Description
organizationId	string (pattern)	Unique identifier for the organization
organizationName	string	Legal name of the organization
organizationType	enum(10 values)	Type of organization
certifications	array<string>	List of certification IDs held by organization
contactEmail	string (email)	Primary contact email address
contactPhone	string (pattern)	Primary contact phone number
equipmentIds	array<string>	Harvester/machine tracking references
establishedDate	string (date)	Date organization was established
facilityCapacity	object (structured)	Facility production or handling capacity for LCFS reporting
harvestSites	array<string>	Operational harvest locations managed
lastUpdated	string (date-time)	Timestamp of the most recent data update
lcfsRegistrationId	string (pattern)	CARB LCFS registration identifier for regulated entities
operationalAreas	array<string>	List of geographic areas where organization operates
operationalStatus	enum(4 values)	Current operational status of the organization
operatorIds	array<string>	Personnel tracking references
primaryGeographicDataId	string (pattern)	Foreign key to primary operational location
regulatedEntityType	enum(5 values)	LCFS regulated entity classification
taxId	string	Tax identification number
traceableUnitIds	array<string>	TRUs managed by this organization
website	string (uri)	Organization website URL

6.0.7 Certificate

Certificate entity representing formal certification records issued by certification bodies

Entity Relationships

This entity references the following entities:

- `certificateId` → `Certificate` (Standard certificate identifier using CERT- pattern)
- `OrganizationId` → `Organization` (Uses EntityNameId convention referencing Organization receiving the certificate)

** [View Certificate in ERD Navigator](erd-navigator/index.html?focus=Certificate)**

Table 8: Entity Definition: Certificate

Field	Type	Description
CertificationBodyId	string	Uses EntityNameId convention referencing CertificationBody
CertificationSchemeId	string	Uses EntityNameId convention referencing CertificationScheme
OrganizationId	string (pattern)	Uses EntityNameId convention referencing Organization receiving the certificate
certificateId	string (pattern)	Standard certificate identifier using CERT- pattern
certificateNumber	string	Official certificate number (primary key)
dateOfExpiry	string (date)	Certificate expiry date
dateOfIssue	string (date)	Date of certificate issuance
scopeOfCertification	string	Summary of certification coverage
status	enum(4 values)	Current certificate status
versionNumber	string	Version identifier of the certification standard
VerificationStatementId	string	Uses EntityNameId convention referencing VerificationStatement for third-part...
auditSchedule	object (structured)	Scheduled audit information
certificateDocument	string (uri)	Link or reference to certificate document
conditionalRequirements	array<object>	Special conditions or requirements
suspensionHistory	array<object>	History of certificate suspensions
versionYear	integer	Year of the standard's relevant version release

6.0.8 CertificationBody

Certification Body entity representing independent organizations authorized to issue certificates

** [View CertificationBody in ERD Navigator](erd-navigator/index.html?focus=CertificationBody

Table 9: Entity Definition: CertificationBody

Field	Type	Description
accreditationStatus	enum(5 values)	Current accreditation status
authorizedSchemes	array<string>	List of certification schemes the CB can certify under
cbId	string	Unique identifier for the certification body (primary key)
cbName	string	Official name of the certification body
cbType	enum(4 values)	Type or category of certification body
contactInformation	object (structured)	Contact details for the certification body
operationalRegions	array<string>	Geographic regions where CB operates (ISO country codes)
validityPeriod	object (structured)	Period of CB authorization
accreditationBody	string	Organization that accredited this CB
performanceMetrics	object (structured)	CB performance and quality indicators
specializations	array<string>	Specific areas of certification expertise

6.0.9 CertificationScheme

CertificationScheme entity defining certification standards and requirements with geographic applicability for Phase 2 BOOST traceability system enhancements

** [View CertificationScheme in ERD Navigator](erd-navigator/index.html?focus=CertificationSc

Table 10: Entity Definition: CertificationScheme

Field	Type	Description
certificationSchemeId	string (pattern)	Unique identifier for the certification scheme
issuingOrganizationId	string (pattern)	Foreign key to organization that issues this scheme
schemeName	string	Official name of the certification scheme
schemeType	enum(6 values)	Type of certification scheme
applicableGeographicAreas	array<string>	Geographic areas where this scheme is applicable
auditRequirements	string	Audit and verification requirements
chainOfCustodyRequirements	string	Chain of custody tracking and documentation requirements
claimTypes	array<string>	Types of claims supported by this scheme
documentationRequirements	array<string>	Required documentation and record-keeping
eligibleMaterialTypes	array<string>	Material types eligible for this certification scheme
lastUpdated	string (date-time)	Timestamp of the most recent data update
schemeDescription	string	Detailed description of the certification scheme
schemeStandard	string	Standard or version identifier
validityPeriod	string	Typical validity period for certifications under this scheme
website	string (uri)	Official website for the certification scheme

6.0.10 Audit

Audit entity in BOOST data model

Entity Relationships

This entity references the following entities:

- `auditId` → `Audit` ()
- `organizationId` → `Organization` ()

** [View Audit in ERD Navigator](erd-navigator/index.html?focus=Audit)**

Table 11: Entity Definition: Audit

Field	Type	Description
`auditDate`	string (date)	No description provided
`auditId`	string	No description provided
`auditType`	enum(Initial, Surveillance, Transfer)	No description provided
`organizationId`	string	No description provided
`auditGeographicDataId`	string	No description provided
`cbId`	string	No description provided
`findings`	string	No description provided
`reportUrl`	string (uri)	No description provided

6.0.11 BOOST Operator Entity Validation Schema

Validation schema for personnel and operator management within the BOOST biomass chain of custody system

Entity Relationships

This entity references the following entities:

- `operatorId` → `Operator` (Unique identifier for the operator (Primary Key))
- `OrganizationId` → `Organization` (Employing organization - uses EntityNameId convention referencing Organization)

** [View BOOST Operator Entity Validation Schema in ERD Navigator](erd-navigator/index.html?focus=BOOSTOperatorEntityValidationSchema)**

Table 12: Entity Definition: BOOST Operator Entity Validation Schema

Field	Type	Description
hireDate	string (date)	Date when operator started employment
isActive	boolean	Current employment status - true if actively employed
lastUpdated	string (date-time)	Timestamp of last record modification
operatorId	string (pattern)	Unique identifier for the operator (Primary Key)
operatorName	string	Full name of the operator
operatorType	enum(10 values)	Type/role of operator within the supply chain
OrganizationId	string	Employing organization - uses EntityNameId convention referencing Organization
certifications	array<string>	Array of certifications held by the operator
contactInfo	['string', 'null']	Phone/email contact information
employeeId	['string', 'null']	Internal employee identification number
equipmentAuthorizations	array<string>	Equipment the operator is authorized to operate
skillsQualifications	array<string>	Relevant skills and qualifications
supervisorOperatorId	['string', 'null']	Foreign key reference to direct supervisor operator (optional)

6.0.12 Material

Material types and specifications

** [View Material in ERD Navigator](erd-navigator/index.html?focus=Material)**

Table 13: Entity Definition: Material

Field	Type	Description
materialCategory	enum(softwood, hardwood, mixed)	No description provided
materialName	string	No description provided
materialTypeId	string	No description provided
applicablePlantParts	array<string>	Plant parts included in this material type
applicableProcessingTypes	array<string>	No description provided
carbonStorageRate	string	No description provided
defaultAssortmentTypes	string	No description provided
density	string	No description provided
energyContent	string	No description provided
excludedPlantParts	array<string>	Plant parts excluded from this material type
lastUpdated	string (date-time)	No description provided
plantPartProcessingSpecs	object	Processing specifications by plant part
standardMoistureContent	string	No description provided
standardQualityGrades	string	No description provided
typicalSpecies	array<string>	No description provided

6.0.13 Species Component

Species composition within TRUs

** [View Species Component in ERD Navigator](erd-navigator/index.html?focus=SpeciesCompo

Table 14: Entity Definition: Species Component

Field	Type	Description
componentId	string	Unique identifier for the species component
percentageByVolume	number (≥0, 100)	Percentage of total TRU volume for this species
species	string	Species name (common or scientific)
traceableUnitId	string	Foreign key back reference to TraceableUnit
volumeM3	number (≥0)	Volume of this species within the TRU in cubic meters
ageYears	integer	Estimated age in years
carbonStorage	string	CO2 data for this species component
dbhCm	number (≥0)	Diameter at breast height in centimeters
defects	array<string>	List of defects or quality issues
harvestTimestamp	string (date-time)	When this species was harvested
harvestingMethod	enum(4 values)	Method used to harvest this species
heightM	number (≥0)	Average tree height in meters
lastUpdated	string (date-time)	Timestamp of the most recent data update
moistureContent	number (≥0, 100)	Moisture content as percentage
plantPartComposition	object	Plant part breakdown within this species component
primaryPlantPart	enum(17 values)	Primary plant part represented by this species component
qualityGrade	string	Species-specific quality grade
scientificName	string	Scientific/Latin name of the species
sourceGeographicDataId	string	Foreign key to geographic origin of this species
structuralClassification	enum(5 values)	Functional classification of the primary plant part

6.0.14 Supplier

Supplier entity in BOOST data model

Entity Relationships

This entity references the following entities:

- `supplierId` → `Supplier` ()

** [View Supplier in ERD Navigator](erd-navigator/index.html?focus=Supplier)**

Table 15: Entity Definition: Supplier

Field	Type	Description
`supplierId`	string	No description provided
`supplierName`	string	No description provided
`GeographicDataId`	string	Supplier location - uses Entity-NameId convention referencing GeographicData
`address`	string	No description provided
`certificateCode`	string	No description provided
`claim`	string	No description provided
`supplierType`	string	No description provided

6.0.15 Customer

Customer entity in BOOST data model

Entity Relationships

This entity references the following entities:

- `customerId` → `Customer` (Unique identifier for the customer)

** [View Customer in ERD Navigator](erd-navigator/index.html?focus=Customer)**

Table 16: Entity Definition: Customer

Field	Type	Description
customerId	string (pattern)	Unique identifier for the customer
customerName	string	No description provided
GeographicDataId	string (pattern)	Customer location - uses EntityNameId convention referencing GeographicData
address	string	No description provided

6.0.16 Supply Base

SupplyBase entity in BOOST data model

Entity Relationships

This entity references the following entities:

- `OrganizationId` → `Organization` (Managing organization - uses EntityNameId convention referencing Organization)

** [View Supply Base in ERD Navigator](erd-navigator/index.html?focus=SupplyBase)**

Table 17: Entity Definition: Supply Base

Field	Type	Description
OrganizationId	string	Managing organization - uses EntityNameId convention referencing Organization
description	string	No description provided
supplyBaseId	string	No description provided
supplyBaseName	string	No description provided
GeographicDataId	string	Supply base location - uses EntityNameId convention referencing GeographicData
equipmentDeployment	array<string>	No description provided
forestRoads	array<string>	No description provided
harvestSites	array<string>	No description provided
skidRoads	array<string>	No description provided
speciesAvailable	array<string>	No description provided
traceableUnitIds	array<string>	No description provided

6.0.17 Supply Base Report

SupplyBaseReport entity in BOOST data model

Entity Relationships

This entity references the following entities:

- organizationId → Organization ()

** [View Supply Base Report in ERD Navigator](erd-navigator/index.html?focus=SupplyBaseRep

Table 18: Entity Definition: Supply Base Report

Field	Type	Description
organizationId	string	No description provided
preparationDate	string (date)	No description provided
sbrId	string	No description provided
publicationUrl	string (uri)	No description provided
reportGeographicDataId	string	No description provided
sourcingPractices	string	No description provided
supplyBaseIds	array<string>	Array of SupplyBase IDs that this report covers
supplyBaseSummary	string	No description provided
sustainabilityMeasures	string	No description provided

6.0.18 Equipment

Equipment entity representing forestry machinery and equipment used in biomass harvesting and processing operations

Entity Relationships

This entity references the following entities:

- `equipmentId` → `Equipment` (Unique identifier for the equipment)
- `organizationId` → `Organization` (Foreign key to owning organization)

** [View Equipment in ERD Navigator](erd-navigator/index.html?focus=Equipment)**

Table 19: Entity Definition: Equipment

Field	Type	Description
equipmentId	string (pattern)	Unique identifier for the equipment
equipmentName	string	Descriptive name of the equipment
equipmentType	enum(12 values)	Type of forestry equipment
operationalStatus	enum(5 values)	Current operational status of the equipment
organizationId	string (pattern)	Foreign key to owning organization
acquisitionCost	number (≥0)	Equipment acquisition cost in USD
acquisitionDate	string (date)	Date equipment was acquired by organization
assignedTrackingPointId	string (pattern)	Foreign key to current location/assignment
certifications	array<string>	Equipment certifications (safety, emissions, etc.)
currentOperatorId	string (pattern)	Foreign key to current operator (if assigned)
insuranceInfo	object (structured)	Equipment insurance information
lastUpdated	string (date-time)	Timestamp of the most recent data update
maintenanceSchedule	object (structured)	Maintenance schedule information
manufacturer	string	Equipment manufacturer
model	string	Equipment model designation
notes	string	Additional notes or comments about the equipment
serialNumber	string	Manufacturer serial number
specifications	object (structured)	Technical specifications for the equipment
yearManufactured	integer	Year the equipment was manufactured

6.0.19 Transaction

Transaction entity in BOOST data model

Entity Relationships

This entity references the following entities:

- `transactionId` → `Transaction` (Unique identifier for the business transaction)
- `OrganizationId` → `Organization` (Primary organization involved in transaction (seller/supplier))
- `CustomerId` → `Customer` (Customer organization (buyer) - uses EntityNameId convention referencing Customer entity)

** [View Transaction in ERD Navigator](erd-navigator/index.html?focus=Transaction)**

Table 20: Entity Definition: Transaction

Field	Type	Description
CustomerId	string (pattern)	Customer organization (buyer) - uses EntityNameId convention referencing Cust...
OrganizationId	string (pattern)	Primary organization involved in transaction (seller/supplier)
contractCurrency	enum(9 values)	Currency code for contract value
contractValue	number (≥0, 999999999.99)	Total monetary value of the transaction
transactionDate	string (date)	Date of business agreement
transactionId	string (pattern)	Unique identifier for the business transaction
transactionStatus	enum(6 values)	Current status of business transaction
BrokerOrganizationId	['string', 'null']	Optional intermediary broker organization - uses EntityNameId convention refe...
GeographicDataId	string	Primary transaction location - uses EntityNameId convention referencing Geogr...
LcfsPathwayId	string (pattern)	CARB-certified pathway identifier for LCFS compliance - uses EntityNameId con...
SalesDeliveryDocumentId	string	Foreign key to sales/delivery documentation - uses EntityNameId convention re...
complianceRequirements	array<string>	Regulatory compliance requirements for transaction
contractSignedDate	['string', 'null']	Date when contract was executed
contractTerms	enum(8 values)	Incoterms delivery conditions
expectedDeliveryDate	['string', 'null']	Expected completion/delivery date
financialTerms	object (structured)	Detailed financial terms and conditions
fuelCategory	enum(10 values)	Category of fuel for LCFS classification
fuelVolume	number (≥0)	Volume of fuel in transaction for LCFS reporting
fuelVolumeUnit	enum(gallons, liters, GGE)	Unit of measurement for fuel volume
lastUpdated	string (date-time)	Timestamp of last modification
manipulationTimestamps	array<string>	Processing step timestamps
mediaBreaksDetected	array<boolean>	Continuity flags per TRU

6.0.20 Transaction Batch

TransactionBatch entity in BOOST data model

Entity Relationships

This entity references the following entities:

- `transactionId` → `Transaction` (Foreign key to parent business transaction)
- `claimId` → `Claim` (Foreign key to primary sustainability claim)

** [View Transaction Batch in ERD Navigator](erd-navigator/index.html?focus=TransactionBatc

Table 21: Entity Definition: Transaction Batch

Field	Type	Description
batchStatus	enum(6 values)	Current status of the physical batch
quantity	number (≥0)	Physical quantity of material in this batch
quantityUnit	enum(7 values)	Unit of measurement for quantity
traceableUnitIds	array<string>	Array of TRU IDs included in this batch
transactionBatchId	string	Unique identifier for the physical material batch
transactionId	string	Foreign key to parent business transaction
additionalClaimIds	array<string>	Array of secondary claim IDs
batchCreatedDate	string (date-time)	When the batch was prepared/created
certificationValidation	object (structured)	Certification and compliance validation data
claimId	['string', 'null']	Foreign key to primary sustainability claim
deliveryDate	['string', 'null']	Actual delivery timestamp
deliveryGeographicDataId	['string', 'null']	Foreign key to delivery location
lastUpdated	string (date-time)	Timestamp of last modification
measurementRecordIds	array<string>	Array of measurement record IDs
mediaBreakDetected	boolean	Flag indicating if traceability continuity was broken
plantPartComposition	object	Plant part composition breakdown
processingHistoryIds	array<string>	Array of processing history record IDs
productionBatchId	['string', 'null']	Foreign key to source production batch
qualityGrade	enum(9 values)	Overall quality grade for the batch
qualityMetrics	object (structured)	Detailed quality assessment metrics
reconciliationStatus	enum(5 values)	Status of volume/quality reconciliation
speciesComposition	array<object>	Species breakdown with percentages
trackingHistory	string	Complete location trail summary
transportationData	object (structured)	Transportation and logistics information

6.0.21 Sales Delivery Document

SalesDeliveryDocument entity in BOOST data model

Entity Relationships

This entity references the following entities:

- `transactionId` → `Transaction` ()

** [View Sales Delivery Document in ERD Navigator](erd-navigator/index.html?focus=SalesDeliv

Table 22: Entity Definition: Sales Delivery Document

Field	Type	Description
`buyerName`	string	No description provided
`dateIssued`	string (date)	No description provided
`documentId`	string	No description provided
`productDescription`	string	No description provided
`quantity`	number	No description provided
`sellerName`	string	No description provided
`buyerAddress`	string	No description provided
`certificateCode`	string	No description provided
`sellerAddress`	string	No description provided
`transactionId`	string	No description provided
`transportReference`	string	No description provided

6.0.22 Measurement Record

Quality measurements and dimensional data

Entity Relationships

This entity references the following entities:

- `operatorId` → `Operator` ()

** [View Measurement Record in ERD Navigator](erd-navigator/index.html?focus=Measurement

Table 23: Entity Definition: Measurement Record

Field	Type	Description
measurementMethod	enum(4 values)	No description provided
measurementTimestamp	string (date-time)	No description provided
recordId	string	No description provided
traceableUnitId	string	No description provided
lastUpdated	string (date-time)	No description provided
measuredDiameter	number (≥0)	No description provided
measuredLength	number (≥0)	No description provided
measuredVolume	number (≥0)	No description provided
measurementGeographicDataId	string	No description provided
moistureAccuracy	number (≥0)	Estimated accuracy of moisture measurement (± percentage points)
moistureContent	number (≥0, 100)	Moisture content as percentage of weight contributed by water (0-100...
moistureMethod	enum(8 values)	Method used to determine moisture content
moistureStandard	enum(5 values)	Standard procedure followed for moisture measurement
operatorId	string	No description provided
speciesMeasurements	array<string>	No description provided
trackingPointId	string	No description provided

6.0.23 Claim

Claim entity in BOOST data model

Entity Relationships

This entity references the following entities:

- claimId → Claim ()

** [View Claim in ERD Navigator](erd-navigator/index.html?focus=Claim)**

Table 24: Entity Definition: Claim

Field	Type	Description
TraceableUnitId	string	Referenced traceable unit - uses EntityNameId convention referencing Traceabl...
claimId	string	No description provided
claimType	enum(9 values)	No description provided
statement	string	No description provided
validated	boolean	No description provided
CertificationSchemeId	string	Certification scheme - uses EntityNameId convention referencing Certification...
applicableSpecies	array<string>	No description provided
claimExpiry	string (date-time)	No description provided
claimPercentage	number (≥0, 100)	No description provided
claimScope	enum(4 values)	No description provided
evidenceDocumentId	string	No description provided
inheritedFromTRU	array<string>	No description provided
lastUpdated	string (date-time)	No description provided
validatedBy	string	No description provided
validationDate	string (date-time)	No description provided

6.0.24 Verification Statement

VerificationStatement entity in BOOST data model

** [View Verification Statement in ERD Navigator](erd-navigator/index.html?focus=VerificationS

Table 25: Entity Definition: Verification Statement

Field	Type	Description
issuingBody	string	No description provided
statementId	string	No description provided
verificationDate	string (date)	No description provided
scope	string	No description provided
transactionBatchId	string	No description provided

6.0.25 BOOST Moisture Content Validation Rules

Comprehensive validation rules and business logic for moisture content tracking across the BOOST data standard

** [View BOOST Moisture Content Validation Rules in ERD Navigator](erd-navigator/index.html?focus=BOOSTMoistureContentValidationRules)**

Table 26: Entity Definition: BOOST Moisture Content Validation Rules

Field	Type	Description

6.0.26 Geographic Data

GeographicData entity in BOOST data model

** [View Geographic Data in ERD Navigator](erd-navigator/index.html?focus=GeographicData)*

Table 27: Entity Definition: Geographic Data

Field	Type	Description
`dataType`	enum(7 values)	Type of geographic data
`description`	string	Human-readable description of the geographic area
`geoJsonData`	object (structured)	Valid GeoJSON object (Point, Polygon, LineString, etc.)
`geographicDataId`	string	Unique identifier for the geographic data
`accessRestrictions`	string	Any access restrictions or special conditions
`accuracy`	number ($\geq$0)	GPS accuracy in meters
`administrativeRegion`	string	Administrative region or jurisdiction
`coordinateSystem`	string	Coordinate reference system (e.g., WGS84, UTM Zone 10N)
`elevationM`	number	Elevation in meters above sea level
`lastUpdated`	string (date-time)	Timestamp of the most recent data update

6.0.27 Tracking Point

TrackingPoint entity in BOOST data model

Entity Relationships

This entity references the following entities:

- `operatorId` → `Operator` ()

** [View Tracking Point in ERD Navigator](erd-navigator/index.html?focus=TrackingPoint)**

Table 28: Entity Definition: Tracking Point

Field	Type	Description
`equipmentUsed`	string	No description provided
`establishedTimestamp`	string (date-time)	No description provided
`geographicDataId`	string	No description provided
`pointType`	enum(4 values)	No description provided
`trackingPointId`	string (pattern)	Unique identifier for the tracking point
`operatorId`	string	No description provided

6.0.28 LCFS Pathway

CARB-certified fuel pathway for LCFS compliance with carbon intensity and regulatory attributes

** [View LCFS Pathway in ERD Navigator](erd-navigator/index.html?focus=LCFSPathway)**

Table 29: Entity Definition: LCFS Pathway

Field	Type	Description
caGreetVersion	string (pattern)	CA-GREET model version used for pathway certification
carbonIntensity	number (≥0, 200)	Certified carbon intensity in gCO2e/MJ
certificationDate	string (date)	CARB pathway certification date
energyEconomyRatio	number (≥0.5, 3.0)	Energy economy ratio multiplier for credit calculation
facilityLocation	string	Production facility location (city, state or geographic region)
feedstockCategory	enum(13 values)	Primary feedstock type for pathway
fuelProduct	enum(8 values)	Final fuel product produced
pathwayId	string (pattern)	CARB-assigned pathway identifier
pathwayType	enum(Lookup$_T$*able*, *Tier*$_1$, *Tier*$_2$)	CARB pathway certification tier
verificationStatus	enum(4 values)	Current CARB verification status
expirationDate	string (date)	Pathway certification expiration date
facilityCapacity	number (≥0)	Annual production capacity in gallons
geographicScope	enum(4 values)	Geographic applicability of pathway
lastUpdated	string (date-time)	Timestamp of most recent pathway data update
processDescription	string	Brief description of production process

6.0.29 LCFS Reporting

Quarterly LCFS compliance report for regulated entities with credit calculations and submission tracking

** [View LCFS Reporting in ERD Navigator](erd-navigator/index.html?focus=LCFSReporting)**

Table 30: Entity Definition: LCFS Reporting

Field	Type	Description
complianceStatus	enum(4 values)	Overall compliance status for the reporting period
netPosition	number	Net credit/deficit position (credits - deficits)
regulatedEntityId	string	Reference to regulated Organization entity
reportingId	string (pattern)	Unique identifier for the quarterly report
reportingPeriod	string (pattern)	Reporting quarter in YYYY-QN format
totalCreditsGenerated	number (≥0)	Total LCFS credits generated in the reporting period
totalDeficitsIncurred	number (≥0)	Total LCFS deficits incurred in the reporting period
totalFuelVolume	number (≥0)	Total fuel volume reported in gallons
VerificationStatementId	string	Uses EntityNameId convention referencing VerificationStatement for third-part...
calculationParameters	object (structured)	Calculation parameters used for credit computation
complianceMetrics	object (structured)	Additional compliance and environmental impact metrics
lastUpdated	string (date-time)	Timestamp of most recent report update
pathwaySummary	array<object>	Summary of activity by LCFS pathway
reportingDeadline	string (date)	CARB deadline for report submission
submissionDate	string (date-time)	Date and time report was submitted to CARB
transactionIds	array<string>	Array of Transaction entity IDs included in this report
verificationDate	string (date-time)	Date of third-party verification completion
verificationRequired	boolean	Whether third-party verification is required for this entity

6.0.30 Product Group

ProductGroup entity in BOOST data model

** [View Product Group in ERD Navigator](erd-navigator/index.html?focus=ProductGroup)**

Table 31: Entity Definition: Product Group

Field	Type	Description
description	string	No description provided
productCategory	enum(solid$_b$*iomass*, *liquid_biofuels*, *biogas*)	No description provided
productGroupId	string	No description provided
productGroupName	string	No description provided
certificationRequirements	array<string>	No description provided
classification	string	No description provided
lastUpdated	string (date-time)	No description provided
qualityStandards	array<string>	No description provided
regulatoryClassification	string	No description provided
relatedMaterials	array<object>	No description provided
typicalUses	array<string>	No description provided

6.0.31 Energy Carbon Data

EnergyCarbonData entity in BOOST data model

** [View Energy Carbon Data in ERD Navigator](erd-navigator/index.html?focus=EnergyCarbon

Table 32: Entity Definition: Energy Carbon Data

Field	Type	Description
dataType	enum(7 values)	No description provided
energyCarbonDataId	string	No description provided
source	enum(4 values)	No description provided
unit	enum(8 values)	No description provided
value	number	No description provided
caGreetVersion	string (pattern)	CA-GREET model version used for calculation
energyEconomyRatio	number (≥0.5, 3.0)	Energy economy ratio for LCFS credit calculation
humidityConditions	number	No description provided
lcfsPathwayType	enum(4 values)	LCFS pathway tier classification
lifeCycleStage	enum(6 values)	Lifecycle stage for carbon intensity data
measurementGeographicDataId	string	No description provided
measurementMethod	enum(9 values)	No description provided
measurementRecordId	string	No description provided
measurementTimestamp	string (date-time)	No description provided
qualityAssurance	string	No description provided
regulatoryBenchmark	number	CARB regulatory benchmark for comparison (gCO2e/MJ)
temperatureConditions	number	No description provided
traceableUnitId	string	No description provided

6.0.32 Data Reconciliation

DataReconciliation entity in BOOST data model

Entity Relationships

This entity references the following entities:

- transactionId → Transaction ()

** [View Data Reconciliation in ERD Navigator](erd-navigator/index.html?focus=DataReconcilia

Table 33: Entity Definition: Data Reconciliation

Field	Type	Description
discrepancy	number	No description provided
forestMeasurement	number (≥0)	No description provided
millMeasurement	number (≥0)	No description provided
reconciliationDate	string (date-time)	No description provided
reconciliationId	string	No description provided
reconciliationStatus	enum(pending, resolved, disputed)	No description provided
traceableUnitId	string	No description provided
discrepancyReason	string	No description provided
lastUpdated	string (date-time)	No description provided
reconciliationOperator	string	No description provided
resolutionNotes	string	No description provided
speciesDiscrepancies	array<string>	No description provided
tolerancePercentage	number (≥0, 100)	No description provided
transactionId	string	No description provided

6.0.33 Mass Balance Account

MassBalanceAccount entity in BOOST data model

Entity Relationships

This entity references the following entities:

- organizationId → Organization ()

** [View Mass Balance Account in ERD Navigator](erd-navigator/index.html?focus=MassBalanc

Table 34: Entity Definition: Mass Balance Account

Field	Type	Description
accountId	string	No description provided
currentBalance	number	No description provided
organizationId	string	No description provided
productGroupId	string	No description provided
balancingPeriod	string	No description provided
conversionFactors	number	No description provided
periodInputs	number	No description provided
periodOutputs	number	No description provided

7 Schema Definitions

7.1 JSON Schema Format

All BOOST entity definitions **must** be provided as JSON Schema Draft-07 compliant schemas with the following **required** structure:

JSON Example: Entity Schema Structure

```
{
  "schema": {
    "$schema": "http://json-schema.org/draft-07/schema#",
    "$id": "https://github.com/carbondirect/BOOST/
           schemas/entity-name",
    "title": "Entity Name",
    "type": "object",
    "properties": { ... },
    "required": [ ... ]
  }
}
```

7.2 Business Logic Validation

Implementations **must** validate entities against 8 categories of business rules:

1. **Volume/Mass Conservation** - Physical conservation laws

2. **Temporal Logic** - Date consistency validation
3. **Geographic Logic** - Spatial relationship validation
4. **Species Composition** - Percentage validation (sum to 100%)
5. **Certification Logic** - Chain of custody validation
6. **Regulatory Compliance** - Jurisdiction-specific rules
7. **Economic Logic** - Price and payment validation
8. **Quality Assurance** - Material quality constraints

Validation Requirements

Conforming implementations **must** validate data against BOOST JSON schemas and implement all required business logic validation rules for their conformance level.

8 Serialization and Exchange

8.1 JSON-LD as Primary Format

BOOST data **must** be serializable to JSON-LD format with:

- Valid `@context` referencing BOOST context definition
- Entity `@type` declarations matching schema names
- Unique `@id` values for all entities

JSON-LD Requirements

All BOOST data exchanges **must** use valid JSON-LD 1.1 format with appropriate context definitions and semantic annotations.

9 Use Cases and Requirements

9.1 Primary Use Cases

BOOST addresses the following primary use cases:

9.1.1 California Biomass Supply Chain Tracking

- Forest management organization harvests certified timber
- Processing facilities transform raw materials into biofuels
- Transportation companies maintain chain of custody
- Regulatory agencies verify compliance with LCFS requirements

9.1.2 Multi-Certification Scheme Management

- Single TRU maintains multiple certification claims (FSC, SBP, PEFC)
- Processing operations preserve claim integrity
- Species-specific claims apply to mixed-species materials
- Third-party verification validates claim accuracy

10 Examples

10.1 Basic TraceableUnit Example

JSON Example: TraceableUnit JSON-LD Example


```
{
  "@context": "https://boost-standard.org/context.jsonld",
  "@type": "TraceableUnit",
  "@id": "https://example.com/tru/TRU-001",
  "traceableUnitId": "TRU-FOREST-001",
  "unitType": "pile",
  "uniqueIdentifier": "BIOMETRIC-SIGNATURE-ABC123",
  "totalVolumeM3": 125.5,
  "materialTypeId": "MAT-DOUGLAS-FIR-SAWLOG",
  "isMultiSpecies": false,
  "harvesterId": "ORG-PACIFIC-FOREST",
  "currentGeographicDataId": "GEO-MILL-YARD-07"
}
```

11 Resources & Community

11.1 Presentations & Demonstrations

The BOOST Community Group has developed comprehensive presentations and demonstrations including:

- BOOST Kickoff Presentation - Overview of the data standard initiative
- Transaction Object Examples - Technical demonstration of data structures
- California Agency Engagement presentations for CalRecycle, CDFA, and Department of Conservation
- BOOST + LCFS Integration technical presentation

11.2 Community Participation

BOOST Membership

Chair: Peter Tittmann (Carbon Direct)
Active Participants: 15+ members from industry stakeholders, regulatory agencies, certification bodies, and technology providers across the biomass supply chain.

12 Security Considerations

12.1 Data Privacy

Implementations **should** consider privacy implications of biomass tracking data:

- Location data may reveal sensitive commercial information
- Biometric identifiers require secure storage and transmission
- Personal operator information needs appropriate access controls

12.2 Data Integrity

Critical security measures include:

- Digital signatures for high-value transactions
- Audit trails for all data modifications
- Backup and recovery procedures for critical supply chain data
- Validation of external data sources and certificates

Security Implementation Requirements

Implementations **must** address authentication of supply chain participants, authorization controls for data access, secure communication channels, and fraud detection mechanisms.

A Entity Relationship Diagrams

A.1 Complete Entity Relationship Overview

The BOOST data model comprises 33 interconnected entities organized into 7 thematic areas:

- **Core Traceability** (5 entities)
- **Organizational Foundation** (6 entities)
- **Material & Supply Chain** (7 entities)
- **Transaction Management** (3 entities)
- **Measurement & Verification** (4 entities)
- **Geographic & Tracking** (2 entities)
- **Compliance & Reporting** (6 entities)

A.2 Thematic Area Diagrams

B Complete Entity Reference

B.1 Entity Summary Table

Entity	Thematic Area	Description	Fields
Data Reconciliation	Compliance	Reporting	DataReconciliation entity in BOOST data model
14			
Energy Carbon Data	Compliance	Reporting	EnergyCarbonData entity in BOOST data model
18			
LCFS Pathway	Compliance	Reporting	CARB-certified fuel pathway for LCFS compliance with carb...
15			

Entity	Thematic Area	Description	Fields
LCFS Reporting	Compliance	Reporting	Quarterly LCFS compliance report for regulated entities w...
18			
Mass Balance Account	Compliance	Reporting	MassBalanceAccount entity in BOOST data model
8			
Product Group	Compliance	Reporting	ProductGroup entity in BOOST data model
11			
Biometric Identifier	Core Traceability	BiometricIdentifier entity in BOOST data model	8
Location History	Core Traceability	Historical movement records of TRUs	14
Material Processing	Core Traceability	Processing operations that transform TRUs with plant part...	18
Processing History	Core Traceability	Complete timeline of processing events with moisture trac...	22
Traceable Unit	Core Traceability	Unique biomass tracking unit with BOOST traceability syst...	21

Entity	Thematic Area	Description	Fields
Geographic Data	Geographic	Tracking	GeographicData entity in BOOST data model 10
Tracking Point	Geographic	Tracking	TrackingPoint entity in BOOST data model 6
Customer	Material	Supply Chain	Customer entity in BOOST data model 4
Equipment	Material	Supply Chain	Equipment entity repre-sented forestry machin-ery and equi... 19
Material	Material	Supply Chain	Material types and specifi-cations 15

Entity	Thematic Area	Description	Fields
Species Component	Material	Supply Chain	Species composition within TRUs 20
Supplier	Material	Supply Chain	Supplier entity in BOOST data model 7
Supply Base	Material	Supply Chain	SupplyBase entity in BOOST data model 11
Supply Base Report	Material	Supply Chain	SupplyBaseReport entity in BOOST data model 9

Entity	Thematic Area	Description	Fields
BOOST Moisture Content Validation Rules	Measurement Verification	Comprehensive validation rules and business logic for moi...	0
Claim	Measurement Verification	Claim entity in BOOST data model	15
Measurement Record	Measurement Verification	Quality measurements and dimensional data	16
Verification Statement	Measurement Verification	VerificationStatement entity in BOOST data model	5
Audit	Organizational Foundation	Audit entity in BOOST data model	8

Entity	Thematic Area	Description	Fields
BOOST Operator Entity Validation Schema	Organizational Foundation	Validation schema for personnel and operator management w...	13
Certificate	Organizational Foundation	Certificate entity representing formal certification reco...	16
CertificationBody	Organizational Foundation	Certification Body entity representing independent organi...	11
CertificationScheme	Organizational Foundation	CertificationScheme entity defining certification standar...	15
Organization	Organizational Foundation	Organization entity with geographic data references and c...	20
Sales Delivery Document	Transaction Management	SalesDeliveryDocument entity in BOOST data model	11
Transaction	Transaction Management	Transaction entity in BOOST data model	30
Transaction Batch	Transaction Management	TransactionBatch entity in BOOST data model	24

B.2 Entity Relationship Map

The following table shows all foreign key relationships between entities:

Source Entity	Field	Target Entity	Description
Audit	`auditId`	Audit	
Audit	`organizationId`	Organization	
Certificate	`certificateId`	Certificate	Standard certificate identifier using...
Certificate	`OrganizationId`	Organization	Uses EntityNameId convention referenc...
Claim	`claimId`	Claim	
Customer	`customerId`	Customer	Unique identifier for the customer

Source Entity	Field	Target Entity	Description
Data Reconciliation	transactionId	Transaction	
Equipment	equipmentId	Equipment	Unique identifier for the equipment
Equipment	organizationId	Organization	Foreign key to owning organization
Location History	operatorId	Operator	
Mass Balance Account	organizationId	Organization	
Material Processing	operatorId	Operator	
Measurement Record	operatorId	Operator	
BOOST Operator Entity Validation Schema	operatorId	Operator	Unique identifier for the operator (P...
BOOST Operator Entity Validation Schema	OrganizationId	Organization	Employing organization - uses EntityN...
Organization	organizationId	Organization	Unique identifier for the organization
Processing History	operatorId	Operator	Foreign key to operator who performed...
Sales Delivery Document	transactionId	Transaction	
Supplier	supplierId	Supplier	
Supply Base	OrganizationId	Organization	Managing organization - uses EntityNa...
Supply Base Report	organizationId	Organization	
Traceable Unit	operatorId	Operator	Foreign key to operator
Tracking Point	operatorId	Operator	
Transaction	transactionId	Transaction	Unique identifier for the business tr...
Transaction	OrganizationId	Organization	Primary organization involved in tran...

Source Entity	Field	Target Entity	Description
Transaction	`CustomerId`	Customer	Customer organization (buyer) - uses ...
Transaction Batch	`transactionId`	Transaction	Foreign key to parent business transa...
Transaction Batch	`claimId`	Claim	Foreign key to primary sustainability...

C JSON Schema Reference

C.1 Schema Validation Rules

This appendix provides detailed information about JSON schema validation rules for all BOOST entities.

C.2 Context Definitions

The BOOST JSON-LD context **must** define:

- Semantic mappings for all entity types
- Property definitions with appropriate vocabularies
- Data type specifications for typed literals
- Language specifications for internationalization

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