

Mission Score API

User's Guide

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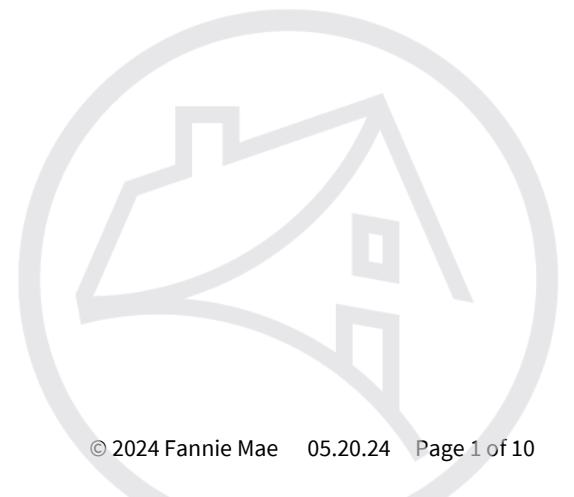




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Introduction

The Mission Score API provides Fannie Mae Sellers and TSPs a means to determine the loan-level mission score for a collection of loans. More information on the mission score can be found on Fannie Mae’s website: [Mission Index Overview | Fannie Mae](#)

API Basics

The Mission Score API is a RESTful web service providing real-time interoperability with REST-compliant Web services and clients.

Mission Score Overview

A loan’s mission score is evaluated over ten social criteria that are grouped into three dimensions: Income, Borrower, and Property. Each dimension is awarded a score of zero (0) or one (1), based on the dimension’s individual criteria. The overall mission score for a loan is the sum of each dimension’s score, thus the score will be an integer value ranging from zero (0) to three (3). The following is a description of each social criteria categorized by dimension:

Dimension	Criteria	AMI Cap
Income	Low-Income Borrower <i>Total Qualifying Income <= AMI cap</i>	80%
	Affordable Rental <i>At least one rental unit in the property is deemed affordable. This means its adjusted yearly rental expense is less than 80% of maximum allowable rental expense based on AMI</i>	N/A
Borrower	First-time Home Buyer <i>At least one borrower is considered a first-time home buyer and Total Qualifying Income <= AMI cap</i>	100%
	Borrower(s) reside in underserved market <i>At least one borrower currently resides in a designated underserved market</i>	N/A
	Special Purpose Credit Program <i>The loan was originated under a special purpose credit program (SPCP): identified with special feature code 878, 880, or 882.</i>	N/A
Property	Low-Income Census Tract <i>Property resides in a designated low-income area and Total Qualifying Income <= AMI cap</i>	100%
	Minority Census Tract <i>Property resides in a designated minority area and Total Qualifying Income <= AMI cap</i>	100%
	High-Needs Rural Census Tract <i>Property resides in a designated high-needs rural area</i>	N/A
	Manufactured Housing <i>Property is manufactured housing and Total Qualifying Income <= AMI cap</i>	100%



	Designated Disaster Area <i>Property resides in a designated disaster area and Total Qualifying Income <= AMI cap</i>	100%
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Mission Score Formulation

The mission score formulation is based on approximately fifteen loan attributes that are needed to evaluate all ten component criteria in each of the three dimensions. Since all attributes are not always known at each stage of a loan's lifecycle and there are use cases for knowing a loan's mission score at any stage, the mission score formulation was designed to provide the most appropriate mission score result based on the collection of loan attributes provided. This allows a loan to be rescored as needed when new attributes are acquired to get an updated score. It should be noted that the mission score can only remain the same or increase when additional information is provided, assuming the original loan data has not changed.

Mission Score Evaluation

The mission score is determined by adding the individual mission scores for each dimension to determine the overall mission score. Each dimension is assigned a mission score value of one if any of its criteria evaluates to true and zero otherwise.

Completeness of Result

A mission score 'completeness' is provided along with the mission score to give an indication to how the missing loan information impacted the loan's mission score. The completeness value is either 'complete' or 'incomplete.'

A value of 'complete' indicates that the calculated mission score is the best this loan will receive, regardless of the missing information. A 'complete' value will occur when all the loan data was provided or when the missing information had no impact. An example scenario of 'no impact' would be when the 'Manufactured Housing' attribute is not provided, but the 'household income' exceeds the AMI cap of 100%. In this case, the 'Manufactured Housing' component of the property dimension will always be false, for either a manufactured home or a site-built home; therefore, the inclusion of the manufactured housing property would never 'flip' the property dimension's mission score from a zero to a one.

A completeness indicator is provided at the mission score level and for each of the mission score dimensions. The mission score completeness is a rollup of the individual dimension completeness indicators, i.e. if any dimension is incomplete, then the overall mission score must be incomplete. A dimension is deemed incomplete when one or more of its component criteria could not be derived due to missing information and the remaining component criteria evaluated as false. In this scenario, the dimension could only be assigned a mission score of zero and the dimension's completeness would be incomplete. In contrast, if any of the dimension's components did meet their criteria, then the mission score for the dimension would be one and the dimension's completeness would be complete since the missing information had no impact on the score.

Dimension Components

The mission score result also includes the breakdown of the mission score by dimension to better understand the composition of the overall score. Each dimension (income, borrower, and property) includes its individual score (zero or one), the completeness of the dimension's score, and the results of evaluating each of the dimension's criteria. The dimension's criteria can have a value of either 'false' (criteria was not met), 'true' (criteria was met), or 'undetermined' (the criteria could not be evaluated with the limited information provided).



A list of messages is provided when a criterion is undetermined that indicate what information was missing that caused the value to be undetermined. The list of specific messages is provided in the API's response section.

Reference Data

The mission score formulation utilizes reference data to determine relevant area median income and census tract related indicators needed to evaluate each component's criteria. The mission score API maintains multiple versions by year. These values are updated as the Federal Housing Finance Authority (FHFA) publishes new tables each year.

The mission score formulation utilizes the loan's loan-application-date to derive the property's area median income value at the time the loan application was officially started; therefore, this attribute is required. It is recommended that the current date be sent when the loan application may not be known to get an indicative score. It is important to note that the score could be different on a subsequent call when the true loan application date is provided.

Request Details

The details of the mission score API's request is described by an OpenAPI-compliant document provided on Fannie Mae's API Developer Portal. This section provides a summary of important details.

URL and Method

Attribute	Value
Base URL	/singlefamily/pricing/loans/loan-pricing
Path	/calc-mission-index
Method	POST

Header Attributes

Key	Value	Required
x-fnma-access-token	The OAuth access token	Yes
x-fnma-api-key	The API key created in Developer Portal	Yes
Content-Type	application/json	Yes
Accept	Application/json	No





Request Body

The API provides the ability to score a batch of 50 loans in one request. Batch sizes greater than this maximum size will require multiple calls. Each loan in the request consists of a unique identifier (*referenceIdentifier*) and loan data. The unique identifier is intended to correlate the loan to its mission score in the response. The value of the unique identifier is a string value determined by the user. Typical choices for the identifier are the loan's unique identifier, a sequentially generated integer value, or a random UUID.

The loan data for each loan is contained in a *LoanData* container. The structure of the *LoanData* container (schema) is MISMO compliant, and the attribute names are ULDD compliant. The loan attributes requested are just the ones that are needed for the mission score formulation. These are enumerated in the Mission Score API's data dictionary, which is a subset of the ULDD data.

The data dictionary and a few sample requests are provided below. One request has sufficient data to return a complete result, one has missing information that results in an incomplete result, and the third results in validation errors.



Data Dictionary	Sample Request (Complete Score)	Sample Request (Incomplete Score)	Sample Request (with Validation Error)
 Mission Score API Data Dictionary May	 Sample Request with No Messages.js	 Sample Request with Messages.json	 Sample Request with Errors.json

Response Details

This section outlines the details of the API's response.

Header Attributes

No header pairs of interest are returned.

Successful Response Body

A successful response will be indicated with an HTTP status code of '207'. The response body consists of a *responseTimestamp* attribute and a *missionScoreResults* attribute. The *responseTimestamp* indicates the time the response was created. The *missionScoreResults* is a list mission score results, one result per loan. The mission score result for a single loan has the following attributes:

Attribute	Description
status	Loan-level HTTP status. Values are either 200 or 500.
referencelIdentifier	<i>referencelIdentifier</i> sent in the request associated with this loan. It is used to correlate the mission score result to its loan in the request
missionScoreEvaluationDate	Set equal to the loan application date, to indicate the date the mission score area median income values was derived for.
missionScore	Overall mission score (sum of the mission score for each dimension). Valid values are 0, 1, 2, or 3.
missionScoreDataCompleteness	Indicates whether the resulting mission score is the true value for the provided loan data, or whether the score could potentially improve if some of the missing data was provided. Valid values are <i>complete</i> and <i>incomplete</i> .
missionScoreIncomeDimension	Each dimension contains its mission score (0 or 1), the completeness of the dimension's score, and the results of evaluating each dimension's criteria. Each criteria result will have a value of either: <i>false</i> , <i>true</i> , or <i>undetermined</i> . A list of messages will be provided when the value is undetermined to provide the cause of not being able to evaluate the criteria.
missionScoreBorrowerDimension	
missionScorePropertyDimension	
censusTractIdentifier	Property's FIPS determined by mission score API

Component Messages

The following are the component messages that indicate what information was missing:

Error Code	Description
101	borrower addresses missing
102	property's fips code not derived from property address
103	borrower fips codes not derived from borrower addresses
104	area median income not derived from property's fips code
105	incomplete rental information



107	borrower resides in underserved market indicator could not be derived
108	low-income census tract indicator could not be derived
109	minority census tract indicator could not be derived
110	high-needs rural indicator could not be derived
111	manufactured housing indicator missing
112	designated disaster area indicator could not be derived
114	special feature code list is missing




Loan-level Messages

The following are loan-level messages that indicate what information was missing that affected the entire mission score evaluation.

Error Code	Description
202	second homes not supported
203	non-conventional loans not supported

Sample Responses

The following are sample responses. These correspond to the sample request scenarios provided.

<u>Sample Response (Complete Score)</u>	<u>Sample Response (Incomplete Score)</u>	<u>Sample Response (with Validation Error)</u>
 Sample Response with No Messages.js	 Sample Response with Messages.json	 Sample Response with Errors.json

System Errors

The following describes the error handling approach and associated error messages.

Request Validation Errors

Below is a list of the validation errors for the Mission Score API. All relevant errors will be returned in the response. The HTTP status will be '400'.

Error Code	Description
1001	Loans must have at most 50 items
1002	Loans must have at least 1 item
1003	referencelIdentifier is required
1004	Loandata is required
1005	Invalid loanIdentifier
1006	Propertyunits must have at most 4 items
1007	propertyUsageType is required
1008	Invalid cityName
1009	Invalid postalCode
1010	Borrowers must have at most 4 items
1011	applicationReceivedDate is required



1012	Invalid applicationReceivedDate
1013	bedroomCount must be at most 9
1014	bedroomCount must be at least 0
1015	Invalid propertyDwellingEnitEligibleRentAmount
1016	propertyDwellingEnitEligibleRentAmount cannot be negative amount
1017	financedUnitCount must be at most 4
1018	financedUnitCount must be at least 1
1019	borrowerCount must be at most 4
1020	borrowerCount must be at least 1
1021	Invalid totalMonthlyIncomeAmount
1022	totalMonthlyIncomeAmount cannot be negative amount
1023	Duplicate referenceIdentifier in Loans
1024	Invalid investorFeatureIdentifier
1025	Property addressLineText is required
1026	Property cityName is required
1027	Property stateCode is required
1028	Property postalCode is required
1029	totalMonthlyIncomeAmount is required
1030	SubjectProperty is required
1031	Qualification is required
1032	Property Address is required
1033	Number of property units exceeds the expected number
1034	TermsOfLoan is required
1035	mortgageType is required
1036	financedUnitCount is required

Internal System Errors

Internal System errors are handled at the request level and at the loan level. Non-recoverable system errors that result in the mission score API's inability to calculate the mission score for all the loans in the request will return a request-level error response with an HTTP status code of '500'. The error response will have a *correlationId* and a generic message about the error. The *correlationId* assists our support staff to identify the relevant logs and audit information.

Internal system errors that occur during the mission score calculation for a specific loan do not fail the entire request. Instead, the request-level HTTP status code will be '207' (multi-status) and the individual loan(s) will have their own HTTP status code of '500'. Each loan's response object will also have error details. This approach is more flexible than failing the entire response when one or more loans had an issue.

Error Code	Category Type	Description
5002	System	Mission Score Service was not able to process the request
5003	System	Unable to retrieve FipsCodes from Geocoder
5004	System	Mission Score Service was not able to process the request for this loan

TSP Onboarding Process

The mission score API is leveraging the ROPC security protocol for TSP and seller access. This does not require the TSP to onboard each of their seller's individually but allows the TSP to create their own single set of credentials to use when accessing the API for any of their sellers. This leads to a similar onboarding process for both TSPs and sellers. The onboarding process for TSPs and sellers is summarized below:



Onboarding in Acceptance Environment

Step	Responsible Party
Receive system ID and user ID for the acceptance environment	Fannie Mae Digital Management Solutions
Customer will login with the assigned User ID and click “Create App”	TSP/Seller Developer
Customer will name the application	TSP/Seller Developer
Customer will then enter the System ID provided	TSP/Seller Developer
Customer will select the Mission Score API product and click the checkbox	TSP/Seller Developer
Customer will click <i>Confirm</i> to generate app tokens	TSP/Seller Developer
Customer will use the app’s client id, client secret, and API key to connect to the Mission Score API using Postman, curl, or custom code	TSP/Seller Developer

Onboarding in Production Environment

Step	Responsible Party
Go to Technology Manager. If the <i>IntelliPrice – Pricing</i> application is not listed under the Granted application tab in Technology Manager, then the Corporate Administrator will need to click on the Available Applications tab and select the <i>IntelliPrice – Pricing</i> application. Please refer to the job aid Setting Up an Available Application in Technology Manager	TSP/Seller Corporate Administrator
In Technology Manager, click on Manage Users and select existing System ID (or create a new System ID) and add the following: <ol style="list-style-type: none"> Select <i>IntelliPrice – Pricing</i> from the Available Applications and click Manage Access In the Roles section, select the <i>API-Prod-Mission-Score</i> role In the Data Folder section, select a Data Folder (aka Seller/Service Number) 	TSP/Seller Corporate Administrator
In Technology Manager, click on Manage Users and select existing User ID (or create a new User ID) and add the following: <ol style="list-style-type: none"> Select the <i>API Developer Portal</i> application from the Available Applications and click Manage Access In the Roles section, select the <i>DevPortal_Org_Admin</i> role In the Data Folder section, select the same Data Folder (aka Seller/Service Number) as selected in step 3 above 	TSP/Seller Corporate Administrator
Customer will login with the assigned User ID and click “Create App”	TSP/Seller Developer or Corporate Administrator
Customer will name the application	TSP/Seller Developer or Corporate Administrator
Customer will then enter the System ID provided	TSP/Seller Developer or Corporate Administrator
Customer will select the Mission Score API product and click the checkbox	TSP/Seller Developer or Corporate Administrator
Customer will click <i>Confirm</i> to generate app tokens	TSP/Seller Developer or Corporate Administrator
Customer will use the app’s client id, client secret, and API key to connect to the Mission Score Service using Postman, curl, or custom code	TSP/Seller Developer or Corporate Administrator



References

- [Fannie Mae Technology Manager for Administrators](#)
- API Developer Portal:
 - [PROD - Developer Portal](#)
 - [UAT - Developer Portal](#)