



ATIS-0300072

**NORTH AMERICAN NUMBERING PLAN
(NANP) EXPANSION REFERENCE DOCUMENT**

August 17, 2002

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**North American Numbering Plan (NANP)
 Expansion Reference Document**

1.0 Background 1

1.1 NANP Expansion Documents 1

1.2 Historical Perspective 2

2.0 Assumptions and Constraints 4

3.0 NANP Functionality..... 7

**3.1 Existing Functions - The existing NANP supports the following
 functionalities: 7**

3.2 Additional Functions 8

3.3 Future Functions..... 9

4.0 Assessment Criteria 11

4.1 Human Factors Needs 11

4.2 Impact on Call Processing and Network Operations 12

4.3 Life Expectancy of Expanded NANP 15

4.4 Numbering Resource Utilization/Efficiency 16

4.5 Accommodating Future Network Requirements 16

4.6 Requirements Between Countries Served by the NANP 16

4.7 Consistency With Public Policy 16

4.8 Uniform Availability of Numbers 16

4.9 Additional Digits 17

4.10 Evolution/Transition 17

4.11 Administration..... 17

5.0 Selection Process 18

6.0 Description of NANP Expansion Options – Phase I..... 21

**6.2 NANP Format Expansion Options - This Section lists the most probable
 options for expanding the existing 10-digit (3 + 3 + 4) format of the NANP. 23**

7.0 Detailed NANP Expansion Option Descriptions – Phase II 25

7.1 Summary of NANP Expansion Options – Phase II 25

7.2 Option 1-A – Four-Digit NPA With a New D Digit and D Digit Release .. 26

**7.3 Option 1-B – Four-Digit NPA With a New D Digit and Four-Digit CO
 Codes 29**

**7.4 Option 1-C – Four-Digit NPA With a New D Digit and Five-Digit Line
 Numbers 33**

7.5 Option 2-A – Four-Digit NPA With a New A Digit and D Digit Release .. 33

**7.6 Option 2-B – Four-Digit NPA With a New A Digit, D Digit Release, and
 Four-Digit CO Codes 39**

**7.7 Option 2-C – Four-Digit NPA With a New A Digit and Five-Digit Line
 Number 44**

7.8 Option 3-A - NDC + NPA With D Digit Release 44

7.9 Options 3-B - NDC + NPA With Four-Digit CO Codes 49

7.10 Option 3-C – NDC + NPA With Five-Digit Line Numbers 55

7.11 Option 4-A – Four-Digit NPA With a New B Digit and D Digit Release 55

**7.12 Option 4-B – Four-Digit NPA With a New B Digit, D Digit Release and
 Four-Digit CO Codes 59**

**8.0 NANP Expansion Plan Description as Documented in the INC Report
 Titled “Recommended Plan for Expanding Capacity of the NANP” 60**

8.1 Recommended NANP Expansion Plan Format 60

8.2	Transition Method 1 (Both Digits Implemented Simultaneously)	61
8.3	Transition Method 2 (Phased Approach With NPA Implemented First)	63
8.4	Transition Method 3 (Phased Approach with CO Code Implemented First)	65
8.5	Comparison of Transition Methods	67
9.0	General Drivers and Timing, for NANP Expansion	70
9.1	Drivers for NANP Expansion	70
9.2	Timing for NANP Expansion	70
10.0	Plan Update Procedures/Responsibilities	73
11.0	Other Fora/Workshops Impacted	74
	Annex A	76
	NANP Standard Prefixes and Access Codes for Originating Calls	76
	Annex B	77
	Phase I & Phase II Eliminated Options/Rationale	77
B.2.4	Expansion Alternative Option 1	79
B.2.5.2	Rationale	80
B.2.6.2	Rationale	81
B.2.7.2	Rationale	81
B.2.8.2	Rationale	82
B 3.7.2.2	Criteria and Rationale for Elimination of Option 3-A	93
B 3.7.3.2	Criteria and Rationale Elimination for Option 4-A	94
	ANNEX C	96
	Other NANP Expansion Proposals Considered	96
	ANNEX D	101
	NANPA NPA EXHAUST PROJECTION	101
	1999 Analysis	101
	2000 Analysis	101
	2001 Analysis	101
	ANNEX E NANP – EXPANSION OPTION EVALUATION MATRIX	(Page 1
	of 2)	103
	ANNEX F	105
	PRO/CON WORKSHEET	105
1A-C11	Current ERC rule will be impacted--e.g., 888 would become 8880...	106
Cons		110

North American Numbering Plan (NANP) Expansion Reference Document

1.0 Background

The Mission of the INC NANP¹ Expansion Workshop is “to develop an industry agreed recommendation for expanding the capacity of the North American Numbering Plan to meet the long term needs of the telecommunications industry and the user community in the geographic area served by the NANP.”

In fulfilling this mission, the INC has generated a series of reports. This document is the reference report that forms part of this INC initiative.

The work leading to this report has identified various alternatives for modifying/expanding the NANP format. INC has evaluated and assessed the implications of various alternatives and produced a recommendation in an accompanying report.

1.1 NANP Expansion Documents

The INC’s work on expansion of the NANP is recorded in a series of documents:

1.1.1 NANP Expansion Reference Document

Description: This NANP Expansion Reference Document, developed through the Industry Numbering Committee consensus process, is intended to provide reference information on the procedures and criteria required to support the selection of an expanded NANP to meet the long-term needs of the telecommunications community for the geographic area served by the NANP. It includes all options that were considered by INC and the rationale for excluding those options no longer under consideration as well as the process by which they were eliminated.

1.1.2 Interim NANP Expansion Report

Description: The Interim Expansion report was issued on December 10, 1999 as 99-1210-025. This INC interim NANP Expansion report provides the details of the five options which were under consideration as of December 10, 1999. The report contains high-level option descriptions, transition plans, significant advantages and disadvantages and identifies prerequisites and dependencies associated with each plan.

¹ The NANP is the basic numbering plan for the public switched telecommunications networks in the following 19 countries in Country Code 1: Anguilla, Antigua & Barbuda, Bahamas, Barbados, Bermuda, British Virgin Islands, Canada, Cayman Islands, Dominica, Dominican Republic, Grenada, Jamaica, Montserrat, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, Trinidad & Tobago, Turks & Caicos Islands, and the United States (including Puerto Rico, the U.S. Virgin Islands, Guam and the Commonwealth of the Northern Mariana Islands).

1.1.3 Recommended Plan for Expanding the Capacity of the North American Numbering Plan

Description: The Recommended NANP Expansion Plan defines the changes in the format and numeric structure of the NANP. It also identifies the transition strategies, trigger points and dependencies required to ensure the smooth and timely evolution of the NANP. This plan is intended to be a living document to be kept current by the industry through regularly scheduled updates or action trigger mechanisms which are identified and maintained in the document. This report INC 02-0107-029 was released on December 13, 2001.

1.2 Historical Perspective

This section provides the reader a brief review of some of the key events in the history of the NANP, as well as a description of the NANP itself.

The Bell System (AT&T) developed the North American Numbering Plan (NANP) in 1947 to route and properly bill customer dialed long distance telephone calls. The NANP was established with a ten-digit dialing pattern that uniquely identified the basic geographic location of each end user. This plan created a hierarchical switching arrangement to assure that a telephone call would not “switch” more than ten times.

The definition of a NANP number is two codes (area code & Central Office code), of three digits each, and a station number² of four digits. The combination of the two codes forms the basis by which the North American Public Switched Telephone Network (PSTN) routes and rates (for billing) telephone messages. In the initial implementation, the first two digits of the Central Office code were defined by the first two letters of the exchange name. Exchange names were associated with geographic communities and letters were printed on telephone dials. The exchange names were carryovers from the manual switchboard era. This was known as “2-5 Numbering.” This stood for 2 letters and 5 numbers. This was replaced by All Number Calling (ANC) in the early 1960s. ANC added digit combinations in each area code that could be used as Central Office codes.

The original NANP format had different formats for the two codes used in a NANP number. Electro-mechanical switch decisions relied on the two codes being different. Subsequent redefinitions of the NANP have resulted in the format of these two codes being exactly the same.

Decimal digits 0 through 9 are used for NANP numbers. After the development of Dual Tone Multi-frequency (DTMF), the characters # and * were added to non-rotary phones. These characters serve as network control characters. The dial equivalent for the * is 1-1. There is no dial equivalent for the # character.

² The terms station number and line number are used throughout this document. For the purposes of this document, the terms are synonymous.

- 1947 Original NANP Format was N (0 or 1) X – NNX – XXXX
N = digits 2 through 9
X = digits 0 through 9
- 1975 NANP Format was N (0 or 1) X – NXX – XXXX
- 1995 NANP Format was NXX – NXX – XXXX

The format of the NANP is sometimes written as ABC-DEF-GHIJ. The 1975 format expanded capacity in the E digit resulting in more Central Office codes in each area code. The 1995 redefinition expanded capacity in the B digit resulting in 640 additional area codes.

2.0 Assumptions and Constraints

The following lists the assumptions and constraints that the INC has used to evaluate NANP expansion options. All of these assumptions and constraints have been agreed to by industry consensus, and all viable options must meet all assumptions and constraints.

- a. The digits of the NANP will be of the decimal system (i.e., “0” through “9”).
- b. The control characters, star (*) and number sign (#), will continue to be used only as control characters to indicate a special dialing/addressing function.
- c. The dial/keyboard/keypad on basic terminals will remain functionally unchanged.
- d. The basic function of manual “dialing” must be maintained (i.e., automatic input will not become universal).
- e. The expanded NANP will remain consistent with International Telecommunications Union (ITU) Recommendation E.164 (Public Telecommunications Numbering Plan). See Figure 1.

The structure of the ITU Recommendation E.164 number is made up of the following fields:

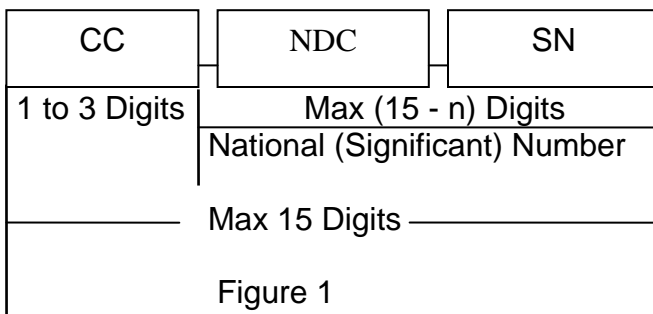


Figure 1
International Public Telecommunication
Numbers for Geographic Areas

where:

CC = Country Code

NDC = National Destination Code

SN = Subscriber Number

n = the number of digits in the Country Code

- f. The length of the National (Significant) Number in the expanded NANP will be limited to twelve digits. This is to ensure compliance with ITU Recommendation E.164 that allows for a maximum length of three digits for

- the country code within the maximum length of fifteen digits for the international number.
- g. The expanded NANP resources will continue to be assigned to and used exclusively by service providers and users who reside in the countries that form the NANP community.
 - h. The expanded NANP must provide for adequate numbering resources for a competitive environment within any of the countries served by the NANP. The plan should not disadvantage one industry segment or NANP country over another.
 - i. The expanded NANP must contain a functional component to increase the quantity of Numbering Plan Areas (NPAs) in order to ensure the availability of additional NPAs when the current supply is exhausted.
 - j. The expanded NANP must mitigate the need for future NPA relief.
 - k. Both expansion plan components, as described above, should be addressed by the expansion proposal. This may be accomplished in one phase (i.e., simultaneously) or through two phases.
 - l. The expanded NANP shall support the Public Switched Telephone Network (PSTN). Private numbering plans are not accommodated by these NANP resources. Existing and future services' interfaces and network capabilities should be supported by the expanded numbering resource.
 - m. The expanded NANP should be implementable with sufficient time to permit both an orderly transition to the expanded format and provide sufficient numbering resources to meet industry requirements.
 - n. The expanded NANP must meet applicable national regulatory or governmental requirements (e.g., number portability, number pooling, etc.) in effect at the time the expanded NANP is implemented.
 - o. The NANP expansion plan must apply throughout the NANP serving area subject to the appropriate regulatory or governmental procedures and constraints. In order to remain part of the NANP each country must implement the accepted NANP expansion plan.
 - p. The expanded NANP should not be constrained by the current practice of assigning line numbers in blocks of ten thousand to switching entities or points of interconnection (POI).
 - q. The expanded NANP must support service provider number portability in both geographic and non-geographic applications. At the time of the release of this report, the following assumptions apply to the portability of geographic numbers:

- i) NPAs will retain geographic significance (i.e., defined geographic coverage areas);
 - ii) portability with pooling will at a minimum cover the top one hundred MSAs in the U.S.;
 - iii) portability and pooling are restricted to a rate center;
 - iv) portability will apply to all geographic numbers used in a wireline/wireless environment;
 - v) location portability will be supported throughout any given portability pooling area and will not be restricted to rate centers; and
 - vi) While service provider portability refers to the ability of end users to retain the same telephone number as they change from one service provider to another, service portability refers to the ability of users of telecommunications services to retain existing telecommunications numbers without impairment of quality, reliability or convenience when switching from one telecommunications service to another service (i.e., POTS to ISDN) provided by the same telecommunications carrier.
- r. The N restriction (i.e., 2 through 9) will be removed from the existing D digit in the Central Office (CO) code field coincident with the implementation of the NANP expansion plan
 - s. The conditions defined in the INC Uniform Dialing Plan will be implemented before the NANP expansion plan is implemented.

3.0 NANP Functionality

The NANP supports the provision of a basic set of functionalities which are described in Section 3.1. The key function provided by the NANP number set itself is user access and, user derived information relevant to that access (e.g., a 213 number is located in Los Angeles, an 800 call is "free", etc.). The ability to use the NANP number to derive the specific information required to perform traditional functions is a product of systematic intelligence provided in the network's infrastructure. In short, the numbering plan is an enabler, and, not a direct provider of most network functions. However, some of the network's most fundamental capabilities are supported in this manner (i.e., rating, routing, billing, etc.).

Therefore, when considering the merits of existing and future NANP based "functionalities," one must consider the impact on existing or new network infrastructure (i.e., switching, billing systems, etc.) to support such functionality.

3.1 Existing Functions - The existing NANP supports the following functionalities:

- **Terminal Identification** - A NANP number uniquely identifies the network service access point/interface for each PSTN terminal in terms of identifying the local switch and the specific switch facilities associated with that terminal.
- **Personal Identification** - When a NANP number is used for personal identification, it uniquely identifies an individual/ person. Call delivery/routing is controlled by a service profile management capability which directs/routes the calls to a terminating point (typically identified by another NANP number) chosen by the called party. Special Access Code (SAC) 500 is currently available for this type of application.
- **Service Identification** - Service identification using NANP numbers is the association between a number and a service. An example is that calls to 800 numbers are "toll-free" to the calling party.
- **Geographic Significance** - For example, the assignment of NPA codes to a specific/discrete geographic area allows callers to determine, and, associate a number with the called geographic location.
- **Terminal and Personal Mobility** - NANP numbers enable networks to identify mobile terminals and mobile subscribers (either those who are traced through the terminal [roaming], or, personal mobility services [PCS]).
- **Roaming** - The current NANP enables wireless roaming.
- **Rating/Billing Information (related to distance sensitivity)** - For example, in the US every geographic NANP number is associated with a specific rate center. Rate

centers provide geographic location information which is used by the network's billing systems to derive the distance between the calling and called party that is used in calculating the cost of a call.

- **Account Information** - The NANP number is widely used by network operators to identify customers with their accounts. Once identified by the NANP number, customer account information such as equipment installed, discount plans, credit rating, etc. information is available.
- **Routing Information (digit analysis, trunk group selection)** - The network utilizes the dialed NANP number to determine how to route each call. Digit analysis of the NANP number is performed at each switching node in a call's path to determine the outgoing trunk group on which to route the call towards its final destination.
- **Limited Service Provider/Network Identification** - Within the ten-digit geographic NANP number, service provider/network identification is achieved through the assignment of a number to a customer from a specific service provider's pool of numbers (e.g., NXX codes in geographic NPAs, etc.) Calls to each customer are automatically routed to them via their service provider's network. The calling customer is provided with no control over either the transit or a terminating network by the NANP number.

In non-geographic applications, NPA 456 was allocated to allow for both transit and terminating network selection on inbound international calls based solely on NANP digit analysis in the originating foreign country. This allocation was made specifically to overcome service provider/network identification shortcomings in the NANP.

- **Internal Network Routing (0/1XX - NPAs)** - Codes in the 0/1 XX range are not currently assignable as NPA codes in the NANP because the "0" and "1" are currently being used as prefixes.³ As a result of this current restriction, codes in the 0/1 XX format are being used extensively in the network to provide internal routing functionality (e.g., test codes for network maintenance, special routing codes for operator services, intra-network routing, etc.).

3.2 Additional Functions

The current NANP was designed prior to the advent of new telecommunications network(s) needs, such as competition, mobility, portability, enhanced services, etc. These emerging needs are being accommodated by the existing NANP but not always in a graceful, effective, or efficient manner.

Some examples of the above include:

- Service Provider identification/selection is achieved using a carrier identification code (CIC) or a prefix dialing arrangement called a carrier access code (CAC)⁴

³ See Annex A for a listing of existing prefixes.

⁴ See Annex A

- The unceasing need to allocate CIC resources to achieve network/carrier identification is an indication of the need for this information by the network and its operators. Information (carrier identification) which is not readily derivable from the existing NANP numbers is therefore being provided ever increasingly through the use of CICs.
- A number of existing or proposed scenarios require one NANP number for dialing and another one for routing. Among such scenarios are some number portability models, wireless roaming (Temporary Local Directory Numbers), and a number of wireline applications such as Remote Call Forwarding (RCF), toll-free (800), memory call, etc.
- The method used to route traffic to a non-geographic number (e.g., 800) does not contain NANP country specific identification within the dialed numbers.
- The trend toward international competition and global service offerings is not well accounted for in the NANP.
- The ongoing need to have "rate center" based numbering assignments (i.e., NXX/rate center) to satisfy billing and accounting needs is causing accelerated depletion of NANP resources in areas where local competition is being implemented.

3.3 Future Functions

The future NANP must take into account the above and provide solutions where feasible. Some functions which may need to be supported by tomorrow's NANP include the following:

- **Terminal Identification** - A NANP number uniquely identifies the network service access point/interface for every PSTN terminal in terms of identifying the local switch and the specific switch facilities associated with that terminal.
- **Personal Identification** - When a NANP number is used for personal identification, it uniquely identifies an individual/person. Call delivery/routing is controlled by a service profile management capability which directs/routes the calls to a termination point (typically identified by another NANP number) chosen by the called party. SAC 500 is currently available for this type of application.
- **Service Identification** - Service identification using NANP numbers is the association between a number and a service. An example is that calls to 800 numbers are "toll-free" to the calling party.
- **Geographic Significance** - For example, the assignment of NPA codes to a specific/discrete geographic area allows callers to determine, and, associate a number with the called geographic location.
- **Terminal and Personal Mobility** - NANP numbers enable networks to identify mobile terminals and mobile subscribers (either those who are traced through the terminal [roaming], or, personal mobility services [PCS]).

- **Rating/Billing Information (related to distance sensitivity)** - For example, in the US every geographic NANP number is associated with a specific rate center. Rate centers provide geographic location information which is used by the network's billing systems to derive the distance between the calling and called party that is used in calculating the cost of a call.
- **Account Information** - The NANP number is widely used by network operators to identify customers with their accounts. Once identified by the NANP number, customer account information such as equipment installed, discount plans, credit rating, etc. information is available.
- **Routing Information (digit analysis, trunk group selection)** - The network utilizes the dialed NANP number to determine how to route each call. Digit analysis of the NANP number is performed at a switching node in a call's path to determine the outgoing trunk group on which to route the call towards its final destination.
- **International Inbound Routing Information** - The international network (i.e., International Switching Centers - ICS's) utilizes the dialed NANP number, preceded by the country code (1) to select the route for international traffic inbound into the NANP serving area. The NANP number should provide sufficient information to ensure that international originated calls can be routed directly to each sovereign entity/country within the NANP serving area.
- **Number Portability** - The expanded NANP must support number portability.
- **Roaming/Mobility** - The expanded NANP must support roaming and mobility functions.
- **Inter-Country Routing/Services Requirements** - Inter-country (intra-NANP and international) services may require the presence of specific information within NANP numbers to enable the direct routing required to support these services, and/or, to ensure compliance with national regulatory requirements for international traffic.
- **Geographic Service Requirements** - The NANP must continue to provide the functions required to support geographic services. Geographic services are generic and basically apply to Plain Ordinary Telephone Service (POTS).
- **Non-Geographic Service Requirements** - Non-geographic services numbering may generically be defined as any service/addressing plan that is not geographically based. However, the services supported by non-geographic numbering are unique today, and undefined for tomorrow. The future NANP must provide the functionality to support both existing and undefined new non-geographic services.
- **Communication Assistance For Law Enforcement Act (CALEA)** must be supported.

Note: The current wireline and wireless nonstandard uses of NANP or NANP formatted resources will be impacted by NANP expansion options.

4.0 Assessment Criteria

This section describes the criteria which have been established by the industry to assess the various NANP expansion options. It is recognized that due to the time frames involved, and, the resulting need to rely on assumptions regarding the future of North American numbering and addressing, that the assessment process must focus on the relative merits of one plan versus another. It is also recognized that certain expansion options may fail to satisfy even the most basic criteria and therefore should/could be eliminated from further consideration as quickly as possible.

Finally, since most expansion options include the potential for a phased approach, assessment must take into account the merits of each phase as well as the total expansion package.

4.1 Human Factors Needs

Any expansion plan will have some impact on the users (e.g., the general public) of the numbering plan. Therefore, the expansion plan should be examined based on the degree of impact from the perspective of the general public. The following four areas should be examined to understand this impact:

4.1.1 Degree of Stability

Any expansion of the NANP capacity will affect all end users. The expansion plan, including any transitional steps, should minimize the frequency and extent of number changes required to implement the new plan [e.g., minimize changes to the basic numbering structure (NPA-NXX-XXXX) where the geographic NPA/NXX portion represents the geographic area associated with the destination address of a call and the last four digits represent the subscriber line number].

4.1.2 Easy to Understand

Acceptance by the general public of any new numbering plan starts with a complete understanding of what is changing in the numbering plan and why it is changing. As an objective, an expansion plan should be relatively simple, without multiple, complex activities that may be difficult to explain to the general public. Any changes should be applied consistently, uniformly and ubiquitously to all end users to avoid confusion, disruption and resistance to its implementation.

4.1.3 Easy to Use

Any new numbering plan must be easy to use by end users. Ease of use is affected by how the new numbering plan differs from the existing NANP format and the quantity and placement of new digits required to be dialed by the end users.

4.1.4 Service Identification

NANP numbers convey to the end user certain information regarding the types of services and rating / billing to be applied to a call. For example, there are the geographic “POTS” numbers, toll free services (e.g., 800), pay-per call services (e.g., 900), emergency services (e.g., 911) and personal communications services (e.g., 500). The expansion plan should maintain number recognition for these types of services.

4.2 Impact on Call Processing and Network Operations

The current ten-digit format of the NANP is inherent in all phases of call processing and, therefore, embedded in the functions provided in all network elements. The major areas/elements potentially impacted by a change in the NANP format include the digit analysis and translation required for call routing, the signaling associated with call set-up and the use of special features, the functions supported by operations support systems (OSSs), the services offered by operator services systems, the recording and billing necessary for preparation and the rendering of customer charges, and the provision of emergency services (e.g., 911).

4.2.1 Digit Analysis and Translations

Digit analysis and translations are required for call routing. Within the current ten-digit format of the NANP six-digit analysis is typically performed on all calls and is sufficient to identify the NPA of a ten-digit dialed call or the NXX of a seven-digit dialed call. This six-digit analysis is used to determine the interLATA toll, intraLATA toll, or local nature of the call, and whether the call must be routed to the presubscribed carrier.

The numbering plan will continue to play a key role in call routing regardless of the plan format. For example, expansion of the NANP to accommodate an additional digit in either or both the NPA or CO code fields will directly impact the digital analysis and translation processes. Digit analysis to identify either the NPA or the CO code would require four digits, and those instances where analysis of both NPA and CO code are required would demand analysis of eight digits (assuming an additional digit is added to both the NPA and CO code). Moreover, translation/routing tables would need to be expanded with the possible resultant need for additional switch memory.

It should be recognized that proposals which do not add digits to the existing ten-digit structure, but add capacity to the numbering plan through the use of presently restricted digits (e.g., the use of “0” or “1” in the D digit) would also impact switch hardware and software associated with digit analysis and translation. Specifically, the use of “0” or “1” in the A or D digit is currently prohibited in most network hardware and software, and their inclusion in valid dialed numbers would require

network modifications. The extent of those modifications would have to be determined.⁵

Examples of current uses of 0/1XX codes (A and D digit) are as follows:

- “NPA-like” codes (e.g., 100, 101 etc.) are used as test codes; these codes can only be dialed by technicians from test positions;
- “Pseudo NPA” codes (0/1XX codes) are used to route traffic on dedicated trunk groups on a switch to switch basis where the actual NPA is deleted and a pseudo NPA is inserted for routing purposes. This may occur on an intranetwork basis or over the public network.
- Central Office codes in the 0/1XX format are used as billing numbers for both INWATS and OUTWATS lines. These numbers are usually in the format of 00X-XXXX for INWATS and 01X-XXXX for OUTWATS.
- Pseudo numbers in the format 0XX-XXXX are sometimes assigned to ACD (auto call distribution) groups to conserve "real" numbers. These numbers are always associated with a "real" lead number and are never directly dialed by subscribers.
- 0/1XX codes are used in the Caribbean for a variety of purposes including USA direct dialing, international inbound 800, and some OSPS services.

Additional network capabilities required for call routing associated with an expanded NANP should be balanced against possible advantages or functionality that a given expansion plan might offer. For example, a format that would include a national destination code (NDC) would require additional analysis and translation, but could afford recognition of a specific network associated with the call.

4.2.1.1 Digit Analysis on Inbound International Calls

The digit analysis required with an expanded NANP could also impact call processing associated with inbound international calls. Specifically, for those numbering resources assigned today to carriers on an NXX basis – e.g., the 500 SAC and the 456 code – call processing in foreign networks can use seven-digit analysis to identify the service provider. Consequently, the call can be routed over that provider’s network rather than routed on a proportionate basis. An expanded NANP that would, for example, include a four-digit area code or a four-digit Central Office code, (or both), and would continue to assign some resources to entities on a Central Office code basis, would clearly require additional analysis and translation capabilities in foreign networks to preserve such carrier specific routing capabilities.

Moreover, any change (i.e., more than seven digits) in the analysis recommended within foreign networks on calls inbound to the NANP would require modification to

⁵ Additional information on the uses of the D digit is documented under INC Issue 159

existing international standards and would, therefore, require activity within international (ITU) standards committees.

4.2.2 Signaling

4.2.2.1 SS7 Standards Impact

A preliminary analysis of Signaling System 7 ISDN User Part (SS7 ISUP) signaling protocol shows that ANSI T1.113 formats for most parameters would not be impacted, as the current defined length is sufficient to incorporate up to sixteen digits, with one identified exception. The parameters examined included called party number, calling party number, charge number, generic address, jurisdiction information, original call number, and redirecting number parameter. All parameters have a defined length that allows up to sixteen digits with the exception of the jurisdiction information parameter (JIP). The JIP as currently defined can accommodate up to six digits. If the NPA or NXX were expanded, or an additional digit was inserted prior to the NPA, the length of the JIP would have to be increased.

A preliminary analysis of the ANSI T1.112 - SCCP protocol standards indicates that the format of the Global Title is variable length. The Global Title contains Global Title Address Information. There are no apparent digit limits. The same appears to be true of ANSI TCAP T1.114 standards. The digit length is variable and a Number of Digits field exists to be encoded to indicate the number of digits in the digits field.

4.2.2.2 SS7 Applications Impact

Applications that have been developed to utilize the SS7 signaling protocol will need to be examined to determine the implementation of the standard and whether or not the application software will need to be modified. Applications that only include six digits in the Global Title Address (GTA), for example, will need to be modified to include additional digits if the NPA and NXX are expanded. Applications that currently include or rely on ten digits in the GTA may need to include additional digits if the number is expanded. Applications that have the Number of Digits field in the TCAP message set to ten will have to be modified to define the new quantity of digits that will be in the Digits field. It is not clear whether implementations of ISUP will be impacted (with the exception of the JIP) because both the T1.113 ISUP standard and the Bellcore generic requirements documentation⁶ support parameter lengths that can accommodate sixteen digits.

4.2.2 Recording and Rating

Call detail recording, performed in network switches and operator systems, is currently designed to accommodate the current ten digit number format. In addition, downstream rating processes, which collect the call detail and develop the charge

⁶ The issue of Bellcore GR 317 reviewed for this analysis, however, does diverge from the T1S1.3 Standard on one parameter and that is the Charge Number Parameter. The Bellcore documentation provides a parameter length that would only support ten digits.

associated with the call are also built upon the current number structure. Specifically, call rating is typically performed by the recognition of the location associated with Central Office codes (NPA-NXX) of the calling and called number, the computation of call distance and time, and the association of the related charge. Location information associated with NPA-NXX is provided in industry documentation. The addition of one or two digits to the existing structure will directly impact these systems and the supporting industry documentation. The addition of one or two digits to the existing structure, and – perhaps to a lesser degree – the use of formerly restricted digits (e.g., “0” or “1” in the D digit position) will directly impact these systems and the supporting industry documentation.

4.2.3 Operations Support Systems

OSSs support a multitude of functions including, for example, repair and provisioning. These areas, along with almost all other areas that involve the use of support systems, use the existing numbering plan for identification of the customer and/or a network switch. Clearly, a change in the structure of the NANP will require modification to allow the use of an expanded NANP number. These modifications may be extensive as NANP numbers are likely to be embedded throughout the software associated with these systems.

4.2.4 Operator Service Systems

Operator Service Systems combine many of the functions described above. That is, these systems perform digit analysis and translation to support call completion on operator handled calls. Further, signaling capabilities are inherent to these systems, not only for call completion, but also for processing associated with alternate billed calls, which are routed through the operator systems. Finally, operator systems may perform recording and can provide real time rating information to callers. Accordingly, because all these functions are impacted with a change in the structure of the NANP, operator systems will require significant modification.

4.2.5 Emergency Systems

911 systems direct emergency calls to a central location the Public Safety Answering Point (PSAP) and identify the location of the calling party. This identification is typically resident in a database that lists the location for the calling number. Significant changes within this database and the mechanisms used to obtain information from the database would be required with any expansion of the NANP structure.

4.3 Life Expectancy of Expanded NANP

A primary goal of any expansion plan is to maximize the life of the expanded NANP numbering resource. This is a function of the quantity of numbers created and the

rate of consumption of those numbers. Any expansion plan should maximize the quantity of numbers.

Annex D provides the details of the estimated exhaust date of the NANP in its current format including the assumptions used in making this determination.

4.4 Numbering Resource Utilization/Efficiency

The expansion plan must support the efficient assignment and utilization of numbers in order to increase the life expectancy of the new numbering plan. The expanded NANP must also support emerging methods for better utilizing NANP resources.

4.5 Accommodating Future Network Requirements

Today's PSTN is comprised of the separate networks of multiple network operators/providers supporting unique services. In addition, there are a number of services such as data, packet and voice that are provided over these networks. Therefore, the continuing growth of individual networks, the services provided and the potential merging of voice/data/video networks will require a numbering plan that accommodates all such future network and service requirements.

4.6 Requirements Between Countries Served by the NANP

The plan should continue to allow for identification of and ubiquitous connectivity between countries served by the NANP. The plan must also be flexible enough to adapt to the possibility for the expansion in the number of countries served by the NANP and the possibility of segregating the use of the resource between networks, network providers and/or service providers within these countries.

4.7 Consistency With Public Policy

An expansion plan should not interfere with the public policy goals and requirements of all of the countries served by the NANP. In order to support a competitive market structure, it is essential that the expansion alternative, in and of itself, introduce no discrimination between or among service providers and the services that they offer.

4.8 Uniform Availability of Numbers

The expansion plan must provide additional numbering capacity that can be used by all segments of industry. The plan should not disadvantage one industry segment or NANP country over another. In addition, any expansion plan needs to consider national, intra-NANP and international inbound calling requirements.

4.9 Additional Digits

Each digit added to the ten-digit NANP number format will add additional capacity and may add additional functionality. The capacity and functionality gained is subject to a cost/benefit analysis. The expanded plan must continue to support existing functions.

4.10 Evolution/Transition

The transition plan should be relatively simple, without multiple complex activities which add layers of difficulty. The transition plan must allow the new numbering structure to be introduced on a network-wide basis at a date certain including a common permissive dialing period throughout the NANP area. The plan must also identify the manner in which future expansion from the new plan to a further expansion plan could be accommodated.

4.11 Administration

Administration of the ten-digit NANP number has been based primarily on the elements in the number (e.g., NPA or area code, NXX or Central Office code and XXXX or line number). Industry assignment guidelines have been developed to administer these resources. Any numbering plan should permit the continued administration of numbering resources based upon the elements in the number and minimize any new administration requirements.

5.0 Selection Process

The INC NANP Expansion workshop has followed a uniform selection and evaluation process in its efforts to ultimately recommend a specific expansion plan to the industry. The objective of the meetings was to identify the best candidates by comparing their relative ability to meet specific assessment criteria with the expectation of recommending a specific expansion plan to the industry. This resulted in fewer viable options at each stage in the selection process. All expansion plan alternatives have and continue to be subjected to this selection/evaluation process. The evaluation and selection process has as an objective to eliminate any plans that do not meet certain criteria thus eliminating non-viable alternatives. Details and the rationale regarding the elimination of plans are documented in Annexes B and C of this report.

Initially, each option was evaluated against the assumptions and constraints. The next phase was an evaluation using the NANP expansion assessment criteria. When a given option failed to meet this evaluation, the rationale for elimination was documented. For example, if a proposed alternative used symbols and digits rather than just the digits 0-9, the plan did not meet the basic assumptions and constraints and was subsequently rejected. In addition, each option was evaluated against assessment criteria relating to such items as: increased usable capacity in numbers; basic human factors; consistency with international standards, etc. When a given option failed to meet this evaluation, the rationale for elimination was documented. For example, plans that added capacity to an irrelevant portion of the number (i.e., in the station/line number field) were rejected.

As indicated in row one of Table 1 below, some of the options were eliminated based on the fact that they conflicted with the Assumptions and Constraints that INC had established. The results of the evaluations are captured in meeting notes and correspondence and recorded in Annex B and C.

Row two of the table shows that other options satisfied the Assumptions and Constraints, but failed to meet critical Assessment Criteria. The justification for these decisions is documented in Annexes B and C.

Row three indicates options that were eliminated using a matrix approach. During this evaluation, INC ranked each option under each category of Assessment Criteria on a comparative basis that resulted in the elimination of a number of options. The rationale for the elimination of these is documented in Annex E.

Row four indicates options that were subjected to a second phase of numerical matrix evaluation that were eliminated based on their relative inability to satisfy the Assessment Criteria, and they are documented in Annex C.

Row five references the Pro/Con analysis that led INC to five potential options documented in the Interim NANP Expansion Report dated December 10, 1999. See Annex F.

After the issuance of the Interim NANP Expansion Report the remaining five options were evaluated (see row six of the table), which were later reduced to two potential alternatives. This phase of the evaluation was based on a more detailed analysis of transition issues, most notably “zero plus” dialing conflicts. The details of this evaluation are documented in Annex B.

At this point, INC had two plans left to consider. One of the plans added one digit to the NPA code (called plan 1A) and the other added two digits to the existing NANP (one digit to the NPA and the other digit to the CO code, referred to as plan 1B). At the same time INC received a suggestion from the FCC regarding the concept of only adding one additional digit to the Central Office code. INC then decided to accommodate all these options into one recommendation that supported the addition of one or two additional digits to the NPA or CO code fields. This resulted in the expansion plan described in the Recommended Plan for Expanding The Capacity of the NANP.

Table 1: High Level View of the Selection Process

Type	Documentation Source	Evaluation Basis:	Additional Documentation
1. Reject upon Summary Evaluation	Annex B and C	Conflict with Assumptions and Constraints	Meeting Notes and Correspondence
2. Further Evaluate and then Reject	Annex B and C	Passed Assumptions and Constraints but Failed Assessment Criteria	
3. Phase I	Annex E	Passed Assessment Criteria and Matrix Phase I	Captured in Matrix
4. Phase II	Annex B Section B.3	Passed Matrix Phase II and Pros & Cons	
5. Short List	Interim Report and Annex B	Pros & Cons	Captured in Meeting Notes
6. Further Review	Annex B Section B.3	More detailed description on how the plans would transition	Final Recommended Plan

6.0 Description of NANP Expansion Options – Phase I

6.1 NANP Format Expansion Alternatives

This Section lists options that would increase the existing capacity (6.4 B) of the NANP without expanding the 10-digit domestic format (3+3+4) of the plan.

Option	Description	Format	Yield	Total
1*	D digit release to “1”-“9”, provides 100 new NXX codes in every NPA	NXX N ¹ XX XXXX	+0.8B	7.2B
2@	D digit release to “0”-“9” provides 200 new NXX codes in every NPA	NXX XXX XXXX	+1.6B	8.0B
2a@	D digit release to “0”-“9” with variable CO code/line number length provides 200 new NXX codes in every NPA	NXX XX XXXXX NXX XXX XXXX NXX XXXX XXX	+1.6B	8.0B
3*	A digit release to “1”-“9” provides 100 new NPA codes (format 1XXX)	N ¹ XX NXX XXXX	+0.8B	7.2B
4*	A digit release to “0”-“9” provides 200 new NPA codes (format 0/1X)	XXX NXX XXXX	+1.6B	8.0B
5*	Combinations of Options 1-4			
5a*	Options 1&3	N ¹ XX N ¹ XX XXXX	+1.7B	8.1B
5b*	Options 1&4	XXX N ¹ XX XXXX	+2.6B	9.0B
5c*	Options 2&3	N ¹ XX XXX XXXX	+2.6B	9.0B
5d*	Options 2&4	XXX XXX XXXX	+93.6B	100.0B

Notes:

X equals the decimal digits “0” through “9”

N equals the decimal digits “2” through “9”

N¹ equals the decimal digits “1” through “9”

* Option eliminated during initial (Phase I) qualification phase. Refer to Annex B for rationale for elimination and for Phase I definition.

@ Option described in detail in Section 7

Option	Description	Format	Yield	Total
6	National Destination Code (NDC) inserted between country code and NANP ten-digit number.	1 + NDC + NANP (NPA NXX XXXX)	N/A	N/A
6a*	NDCs assigned to existing countries or geographic areas Canada, USA, Caribbean, etc. assume NDCs of one digit	1 + N + NANP (NPA NXX XXXX)	44.8 B	51.2 B
6b @	NDCs assigned to geographic sectors of the NANP service area e.g., Canada, Caribbean, sub-divided USA	1 + N + NANP (NPA NXX XXXX)	44.8 B	51.2 B
6c*	NDCs assigned as per CIC application i.e., carriers, networks, service providers, etc., assume four-digit NDC	1 + NXXX + NPA NXX XXXX	44.8 T	51.2 T
7*	Country Code segregation – Canada, USA, Caribbean countries assigned three-digit country codes followed by ten-digit NANP-like numbers # CC x 6.4 B	100 + NPA NXX XXXX	N/A	N/A

Notes:

X equals the decimal digits “0” through “9”

N equals the decimal digits “2” through “9”

N¹ equals the decimal digits “1” through “9”

* Option eliminated during initial (Phase I) qualification phase. Refer to Annex B for rationale for elimination. Refer to Annex B for Phase I definition.

@ Option described in detail in Section 7

6.2 NANP Format Expansion Options - This Section lists the most probable options for expanding the existing 10-digit (3 + 3 + 4) format of the NANP.

Option	Description	Format	Yield	Total
E1@	-Four-digit NPA codes -assume D digit replacement -7200 new NPA codes	NPA NXX XXXX NXX(X) NXX XXXX	+57.6 B	64.0B
E1a@	-Four-digit NPA codes -add additional digit in A position -7200 new NPA codes	NPA NXX XXXX (N)NXX NXX XXXX (N)XXX NXX XXXX	+57.6B	64.0B
E2*	-Five-digit NPA codes -assume D&E digit replacement -79200 new NPA codes	NPA NXX XXXX NXX(XX) NXX XXXX	+633.6 B	640.0B
E3*	-Network Identification Code (NIC) field between NPA and NXX codes -assume a two-digit NIC + D&E digit replacement	NPA NIC NXX XXXX NPA XX NXX XXXX	+633.6 B	640.0B
E4@	-Four-digit NXX (CO) codes -assume G digit replacement -7200 new NXXs in every NPA	a) NPA NXX(X) XXX b) NPA (X)NXX XXX	+57.6B	64.0B
E4a@	-Four-digit NXX (CO) codes -assume G digit replacement -7200 new NXXs in every NPA	NXX NXX XXXXX NXX NXXX XXXX NXX NXXXX XXX	57.6B	64.0B
E5*	-Five-digit NXX (CO) codes -assume G&H digit replacement -79200 new NXXs in every NPA	NPA NXX(XX) XXXX	+633.6 B	640.B
E6@	-Five-digit subscriber numbers -assume new K digit -100,000 line #s in every NXX	NPA NXX XXXX(X)	+57.6B	64.0B
E6a@	-Five-digit subscriber numbers -assume new K digit -100,000 line #s in every NXX	NXX NXX XXXXX NXX NXXX XXXX NXX NXXXX XXX	+57.6B	64.0B
E7*	-Six-digit subscriber numbers -assume new K&L digits -100,000 line #s in every NXX	NPA NXX XXXX(XX)	+633.6 B	640.0B

Notes:

1. The International Network Destination Code (NDC) option is not listed, as it would effectively create a new numbering field outside of the 10-digit (3 + 3 + 4) NANP.
 2. Combinations of the options listed in Sections 6.1 & 6.2 should also be considered. i.e., Section 6.1 - option # 2 & Section 6.2 - option # 2
 3. Expansion of numbering space could be focused on specific segments according to their application; i.e., SACs could have their subscriber number length increased to five or more digits.
- * Option eliminated during initial (Phase I) qualification phase. Refer to Annex B for rationale for elimination.
- @ Option described in detail in Section 7.

7.0 Detailed NANP Expansion Option Descriptions – Phase II

This section contains detailed descriptions of the NANP expansion options that were selected for detailed analysis during Phase II of the project.

7.1 Summary of NANP Expansion Options – Phase II

1-A	Four-Digit NPA NXX (X)	With +	D Digit release XXX XXXX (Note 4)
1-B	Four-Digit NPA NXX (X)	With +	Four-Digit CO Codes (X) XXX XXXX (Note 4)
1-C	Four-Digit NPA NXX (X)	With +	Five-Digit Line Numbers XXX XXXX (X) (Notes 4,5)

2-A	Four-Digit NPA (N) NXX	With +	D Digit release XXX XXXX (Notes 1,4)
2-B	Four-Digit NPA (N) NXX	With +	Four-Digit CO Codes (X) XXX XXXX (Note 4,6)
2-C	Four-Digit NPA (N) NXX	With +	Five-Digit Line Numbers XXX XXXX (X) (Notes 4,5)

3-A	NDC + NPA (N) + NXX	With +	D Digit release XXX XXXX (Note 2,3,4)
3-B	NDC + NPA (N) + NXX	With +	Four-Digit CO Codes (X) XXX XXXX (Notes 2,3,6)
3-C	NDC + NPA (N) + NXX	With +	Five-Digit Line Numbers XXX XXXX (X) (Notes 2,3,4,5)

4-A	Four-Digit NPA N(X)XX	With +	D Digit release XXX XXXX (Note 4)
4-B	Four-Digit NPA N(X)XX	With +	Four-Digit CO Codes and D Digit release (X) XXX XXXX (Note 4,6)

Notes:

1. Second Digit (B) in NPA field could be to X.
2. First Digit (B) in NPA field could be released to X.
3. Single Digit NDC (N-Range “2”-“9”)
4. All options potentially include a variable CO + Line # Fields
i.e., XXX + XXXX(X), or, XXXXX + XXX(X), or, XXXXX XX(X)
5. Option Eliminated at INC 39, rationale for this elimination is documented in Annex B.
6. Option eliminated at INC 45, rationale for this elimination is documented in Annex B.

7.2 Option 1-A – Four-Digit NPA With a New D Digit and D Digit Release

The fields of this expanded structure are consistent with the fields defined in the current NANP structure and, therefore, support the same functionalities. All “Series 1” options expand the structure of the numbers available in the NANP with the use of an additional digit to the area code (NPA) and the modification or addition of the digit fields that define the Central Office code or line number. Specifically, all “Series 1” options append a digit to the area code generating an NPA field of the form NXX(X). Further, Option 1-A releases the D digit, the first digit of the Central Office code in the current NANP structure, to allow the use of the digits “0” or “1” in addition to the currently available digits “2” through “9”.

7.2.1 Format/Layout

Option 1-A adds a fourth digit to the area code field and uses a released D digit to allow the use of the digits “0” or “1” (in addition to digits “2” through “9”) as the first digit in the Central Office code field. The number format for this option is as follows:

NXX(X) + XXX + XXXX

where N represents digits “2” through “9”, X represents digits “0” through “9”, and:

NXX(X) = a four-digit NPA with (X) the additional digit
XXX = a three-digit Central Office code with a released D digit
XXXX = a four-digit line number

Option 1-A could potentially be implemented with the new fourth digit of the NPA being either “0” or “1” allocated for Canada’s exclusive and permanent use. During a transition period only the digits “0” and “1” can be used throughout the NANP. All non-geographic NPAs will be assigned a new fourth digit, either “0” or “1”, across the entire NANP area. The allocation of the specific digits is unresolved. After transition, the values “2” through “9” will be assigned for growth.

Examples of expanded NANP numbers below show the digit “0” being assigned to Canada and the digit “1” assigned to the remainder of the NANP during transition for geographic numbers.

For example: 972 NXX XXXX becomes 9721 XXX XXXX

 202 NXX XXXX becomes 2021 XXX XXXX

 613 NXX XXXX becomes 6130 XXX XXXX

 514 NXX XXXX becomes 5140 XXX XXXX

Non-Geographic NPAs would be changed as follows:

800 XXX XXXX becomes 8000 XXX XXXX

900 XXX XXXX becomes 9000 XXX XXXX

Special Use Codes would be dialed as follows:

N11 codes would stay N11

950 XXXX would stay 950 XXXX

202 555 1212 would change to 2021 555 1212

555 XXXX would stay 555 XXXX

7.2.2 Capacity

The existing NANP format (NXX + NXX + XXXX) mathematically provides 6.4 billion numbers (800 x 800 x 10,000). Option 1-A increases the number of available area codes from 800 to 8,000 and the number of available Central Office codes from 800 to 1,000. The mathematical quantity of numbers available with this option is therefore:

$$NXX(X) + XXX + XXXX; (8,000 \times 1,000 \times 10,000) = 80 \text{ billion}$$

Option 1-A therefore provides approximately a twelve-fold increase in capacity relative to the existing NANP structure. Importantly, within each NPA, the quantity of numbers is increased by two million.

7.2.3 Starting Point Assumptions

In addition to the basic NANP Expansion Assumptions listed in Section 2.0 of the NANP Expansion Report, the following "starting point" assumptions are made:

- the expansion plan will consist of two functional components; one to expand NPA capacity and one to mitigate NPA exhaust.
- both expansion plan components, as described above, will be implemented simultaneously (i.e., no "phased" expansion approach).
- the N (i.e., "2" through "9") restrictions will be removed from the CO code field.
- the conditions defined in the INC Uniform Dialing Plan will be implemented before the NANP Expansion Plan is implemented. Specifically, the prefix "1" will be eliminated as a toll indicator, and, all intra-NANP calls will be dialed on a ten-digit basis.

Note: Ten-digit dialing is required to enable D digit release

7.2.4 Functionality of NANP Number

The fields of this expanded structure are consistent with the fields defined in the current NANP structure and, therefore, support the same functionalities.

The area code or NPA field designates a particular geographic area in which the number is assigned. In addition, the NPA could be used to identify a specific service for which the subtending numbers are designated (e.g., a Service Access Code or Easily Recognizable Code) Each NPA can support the full capacity of the seven-digit number which follows the NPA code.

The Central Office code field further defines the geographic area within the NPA where the number is assigned. In a non-number portable and non-number pooling environment the Central Office code field could identify the specific switch from which the subscriber assigned the number is served. If service provider number portability and/or number pooling is available the Central Office code field would identify the rate center in which the subscriber is served. If the NPA is designated as a non-geographic Service Access Code (SAC) or Easily Recognizable Code (ERC) to be shared among service providers, and number portability is not available for the designated service, the associated Central Office codes associated with that NPA could be used to identify specific service providers.

The line number field uniquely identifies the subscriber or terminal assigned the number.

7.2.5 Dialing Plan

A uniform dialing plan, consistent with the concept proposed in the INC Uniform Dialing Plan recommendation could be used for all "Series 1" options. Specifically, this dialing arrangement would require all calls, inter-NPA and intra-NPA, both local and toll to be dialed using the full dialing string; that is eleven digits. No prefix (i.e., "1") would be required for direct dialed and direct billed calls. Calls requiring operator assistance or alternative billing would be dialed "0"+. The need for toll indication to the calling party, if mandated by regulatory directive, could be provided by the network in the form of a tone or announcement or through continued use of the prefix 1.

On international calls inbound to the NANP area, the dialing plan will consist of the international access code followed by the (NANP) country code "1" and the full eleven-digit NANP number.

7.2.6 Routing/Translation Implications

Information embedded in the dialed number will be used by network switches to appropriately process and route the call. Whatever digit analysis scheme the SP currently uses, it will increase in complexity by one digit. It should be recognized that routing/translation implications are, in general, common to all options in "Series 1."

Finally, in an environment which supports number portability and number pooling, call routing will be dependent on the identification, within the (N-1) network in the call path, of the dialed number as a ported or pooled code, and the use of the necessary portability related call processing. Identification of the dialed number as a ported code will typically require analysis of all eleven digits.

Within the current ten-digit NANP structure, proper routing of certain inbound international calls requires seven-digit analysis and translation by the originating carrier (i.e., the carrier outside the NANP). Such treatment, which is consistent with existing ITU Recommendation E.164, permits analysis of the country code, area code and Central Office code of the dialed NANP number. Expansion of the NANP format as proposed in Option 1-A, suggests that the ITU recommendation may need to be modified to specify eight-digit translation on these calls.

7.2.7 Transition Considerations

Adding the specific new digits (i.e., “0” or “1”) in the fourth position of the NPA code creates a means to transition to the expanded format. Since the fourth digit in the existing ten-digit NANP can never have a “0” or “1” in that position, introducing these values in the D digit position will provide the necessary indication for all switching equipment and operational systems to ensure identification of an expanded NANP number. Thus, transitioning will be accomplished through this unique assignment of “1” or “0” in the D digit location.

Because of this unique assignment, it will be possible to allow for a permissive dialing period during which the network will be able to determine whether the caller was dialing a ten-digit or an eleven-digit number by checking the value of the D digit. It is recommended that a six-month permissive dialing period be allowed to effect a smooth transition to the new four-digit area codes.

During the transition period only four-digit NPAs with “0” or “1” in the D digit position would be introduced. At the end of the transition period, four-digit NPA codes that do not have a “1” or “0” in the fourth digit can then be assigned.

7.3 Option 1-B – Four-Digit NPA With a New D Digit and Four-Digit CO Codes

The fields of this expanded structure are consistent with the fields defined in the current NANP structure and, therefore, support the same functionalities. All “Series 1” options expand the structure of the numbers available in the NANP with the use of an additional digit to the area code (NPA) and the modification or addition of the digit fields that describe the Central Office code or line number. Specifically, all options append a digit to the area code generating an NPA field of the form NXX(X). Option 1-B expands the Central Office code field to four digits by adding a new digit to the front of the existing Central Office code [i.e., (X)XXX].

7.3.1 Format/Layout

Option 1-B adds a fourth digit to the area code field and a fourth digit to the Central Office code field (with a released D digit) as well. The format for this option is as follows:

NXX(X) + (X)XXX + XXXX

where N represents digits “2” through “9”, X represents digits “0” through “9”, and:

NXX(X) = four-digit NPA with (X) the additional digit

(X)XXX = a four-digit Central Office code with (X) the additional digit

XXXX = a four-digit line number

Option 1-B could potentially be implemented with the new fourth digit of the NPA being either “0” or “1” allocated for Canada’s exclusive and permanent use. During a transition period only the digits “0” and “1” can be used throughout the NANP. All existing non-geographic NPAs will be assigned a new fourth digit, either “0” or “1”, across the entire NANP area. The allocation of the specific digits is unresolved. After transition, the values “2” through “9” will be assigned for growth.

Examples of expanded NANP numbers below show the digit “0” being assigned to Canada and the digit “1” assigned to the remainder of the NANP during transition for geographic numbers.

For example: 972 NXX XXXX becomes 9721 (1)XXX XXXX

202 NXX XXXX becomes 2021 (1)XXX XXXX

613 NXX XXXX becomes 6130 (0)XXX XXXX

514 NXX XXXX becomes 5140 (0)XXX XXXX

Non-Geographic NPAs would be changed as follows:

800 XXX XXXX becomes 8000 (0)XXX XXXX

900 XXX XXXX becomes 9000 (0)XXX XXXX

Special Use Codes would be dialed as follows:

N11 codes would stay N11

950 XXXX would stay 950 XXXX

202 555 1212 would change to 2021 (1)555 1212

555 XXXX would stay 555 XXXX

7.3.2 Capacity

Option 1-B increases the number of available area codes from 800 to 8,000 and the number of Central Office codes from 800 (derived from a CO code format of NXX) to 10,000. The mathematical quantity of numbers available with this option is therefore:

$$\text{NXX(X)} + \text{(X)XXX} + \text{XXXX}; (8000 \times 10,000 \times 10,000) = 800 \text{ billion}$$

Option 1-B therefore provides approximately a 125-fold increase in the quantity of available numbers relative to the existing NANP structure. Within each NPA, the addition of 9,200 Central Office codes increases the quantity of numbers in the NPA by 92 million.

7.3.3 Starting Point Assumptions

In addition to the basic NANP Expansion Assumptions listed in Section 2.0 of the NANP Expansion Report, the following "starting point" assumptions are made:

- the expansion plan will consist of two functional components; one to expand NPA capacity and one to mitigate NPA exhaust.
- both expansion plan components, as described above, will be implemented simultaneously (i.e., no "phased" expansion approach).
- the N (i.e., "2" through "9") restrictions will be removed from the CO code field.
- the conditions defined in the INC Uniform Dialing Plan will be implemented before the NANP Expansion Plan is implemented. Specifically, the prefix "1" will be eliminated as a toll indicator, and, all intra-NANP calls will be dialed on a ten-digit basis.

Note: Ten-digit dialing is required to enable D digit release

7.3.4 Functionality of NANP Number

The fields of this expanded structure are consistent with the fields defined in the current NANP structure and, therefore, support the same functionalities.

The area code or NPA field designates a particular geographic area in which the number is assigned. In addition, the NPA could be used to identify a specific service for which the subtending numbers are designated (e.g., a Service Access Code or Easily Recognizable Code) Each NPA can support the full capacity of the eight-digit number which follows the NPA code.

The Central Office code field further defines the geographic area within the NPA where the number is assigned. In a non-number portable and non-number pooling environment the Central Office code field could identify the specific switch from

which the subscriber assigned the number is served. If service provider number portability and/or number pooling is available the Central Office code field would identify the rate center in which the subscriber is served. If the NPA is designated as a non-geographic SAC or ERC to be shared among service providers, and number portability is not available for the designated service, the associated Central Office codes associated with that NPA could be used to identify specific service providers.

The line number field uniquely identifies the subscriber or terminal assigned the number.

7.3.5 Dialing Plan

A uniform dialing plan, consistent with the concept proposed in the INC Uniform Dialing Plan recommendation could be used for all "Series 1" options. Specifically, this dialing arrangement would require all calls, interNPA and intraNPA, both local and toll to be dialed using the full dialing string; that is twelve digits. No prefix (i.e., 1+) would be required for direct dialed and direct billed calls. Calls requiring operator assistance or alternative billing would be dialed 0+. The need for toll indication to the calling party, if mandated by regulatory directive, could be provided by the network, in the form of a tone or announcement or through continued use of the prefix 1.

On international calls inbound to the NANP area, the dialing plan will consist of the international access code followed by the (NANP) country code "1" and the full twelve-digit NANP number.

7.3.6 Routing/Translation Implications

Information embedded in the dialed number will be used by network switches to appropriately process and route the call. Whatever digit analysis scheme the SP currently uses, it will increase in complexity by two digits. It should be recognized that routing/translation implications are, in general, common to all options in "Series 1."

Finally, in an environment which supports number portability and number pooling, call routing will be dependent on the identification, within the (N-1) network in the call path, of the dialed number as a ported or pooled code, and the use of the necessary portability related call processing. Identification of the dialed number as a ported code will typically require analysis of all twelve digits.

Within the current ten-digit NANP structure, proper routing of certain inbound international calls requires seven-digit analysis and translation by the originating carrier (i.e., the carrier outside the NANP). Such treatment, which is consistent with existing ITU Recommendation E.164, permits analysis of the country code, area code and Central Office code of the dialed NANP number. Expansion of the NANP format as proposed in Option 1-B suggests that the ITU Recommendation E.164 may need to be modified to specify nine-digit translation on these calls.

7.3.7 Transition Considerations

Transition to the expanded NANP is facilitated by adding the digits “00” or “11” in the fourth and fifth positions after the existing three-digit NPA, except for Special Use Codes. As the fourth digit in the existing ten-digit NANP cannot be a “0” or “1”, using one of those values in the D digit position will provide the necessary indication for all switching equipment and operational systems to ensure identification of an expanded twelve-digit NANP number.

By checking the value of the D and E digits, it will be possible to allow for a permissive dialing period during which time the network switches will be able to determine whether the caller was dialing a ten or twelve-digit number.

It is recommended that a six-month permissive dialing period be used to effect a transition to the 1-B format.

At the end of the transition period, four-digit NPA codes and four-digit CO codes that do not have a “1” or “0” in the fourth and fifth positions can then be assigned.

7.4 Option 1-C – Four-Digit NPA With a New D Digit and Five-Digit Line Numbers

Option 1-C was eliminated at INC 39. The rationale for this elimination is found in Annex B.

7.5 Option 2-A – Four-Digit NPA With a New A Digit and D Digit Release

Option 2-A involves the addition of a single leading digit to the area code as a new additional digit in the NANP number. In addition, the existing ten-digit NANP number format is expanded by releasing the D digit to take on X values (i.e., “0” through “9”). Note: The D digit is located in the E position with the introduction of an additional area code digit.

7.5.1 Format/Layout

The new NANP number format is as follows:

(N) NXX + XXX+ XXXX

where:

N = “2” through “9”

NPA = Four-digit field (NNXX)

XXX = Three-digit field (Central Office code)

XXXX = Four-digit subscriber number field

There are two sub-options available under Option 2-A. The first, involves the release of the first digit in the original NPA field from the current N restriction (i.e., “2” through “9”) to X, where X = “0” through “9”. The first digit is always assumed to take on the N restriction (i.e., “2” through “9”).

The second involves the use of variable field lengths within the Central Office code plus line number field. The total length of this field would be fixed at seven digits, however, deployment could involve varying combinations [i.e., 3 + 4 (XXX + XXXX); 4 + 3 (XXXX + XXX)]; and/or 2 + 5 (XX + XXXXX).

Initially, that is during the transition period, only the digit “2” will be used as the new A digit to create four-digit NPA codes.

For example: 972 NXX XXXX becomes 2972 XXX XXXX
 202 NXX XXXX becomes 2202 XXX XXXX
 613 NXX XXXX becomes 2613 XXX XXXX
 514 NXX XXXX becomes 2514 XXX XXXX

Non-Geographic NPA's would be changed as follows:

 800 NXX XXXX becomes 2800 XXX XXXX
 900 NXX XXXX becomes 2900 XXX XXXX

Special Use Codes would be dialed as follows:

 N11 codes would remain as N11
 950 XXXX would stay 950 XXXX
 202 555 1212 would change to 2202 555 1212
 555 XXXX would stay 555 XXXX

7.5.2 Capacity

The new four-digit NPA (with the A digit restricted to N format) provides an eightfold increase in the number of NANP resources. Therefore, assuming the existing three-digit NPA codes retain the NXX format, the total number of NPAs available is 6,400 (i.e., 8 x 800). The suboption of NPAs in the XXX format provides a total of 8,000 NPAs (i.e., 8 x 1,000). The release of the D digit creates 1,000 Central Office codes behind each NPA code.

The new capacity is therefore:

(N)NXX + XXX + XXXX; (8 x 800 x 1,000 x 10,000) = 64 billion,

or ,

(N)XXX + XXX + XXXX; (8 x 1,000 x 1,000 x 10,000) = 80 billion

Note: The capacity of the existing NANP in the NXX + NXX + XXXX format = 6.4 billion

7.5.3 Starting Point Assumptions

In addition to the basic NANP Expansion Assumptions listed in Section 2.0 of the NANP Expansion Report, the following "starting point" assumptions are made:

- the expansion plan will consist of two functional components; one to expand NPA capacity and one to mitigate NPA exhaust.
- both expansion plan components, as described above, will be implemented simultaneously (i.e., no "phased" expansion approach).
- the N (i.e., "2" through "9") restrictions will be removed from the CO code field.
- the conditions defined in the INC Uniform Dialing Plan will be implemented before the NANP Expansion Plan is implemented. Specifically, the prefix "1" will be eliminated as a toll indicator, and, all intra-NANP calls will be dialed on an eleven-digit basis.

7.5.4 Functionality of NANP Number

The various fields of the new NANP number as defined in Section 6.5.1 above are assumed to support the following functionalities. The NPA field will provide unique geographic location or service identification.

The CO code field will provide either service provider or geographic identification (or both) within the NPA from which they are assigned.

The line number field will provide the unique subscriber identification required within each CO code from which they are assigned.

7.5.5 Dialing Plan

The following dialing plan scenarios are predicated on the above assumptions. In all examples, the full international number assigned to the called NANP subscriber is assumed to be 1 + 2972 + 718 + 6297; where 1 = country code, 2972 = NPA, 718 = CO code, 6297 = line number.

7.5.5.1 Intra-NPA Call

This call type involves a call between two NANP subscribers in the same NPA. The called number is as follows:

NPA + CO + Line Number (LN)

where:

NPA = 4 digit indicator within C.C. 1

CO = 3-4* digit indicator within the NPA

LN = 3-4* digit identifier within the CO code

i.e., 2972 + 718 + 6297

* variable field length option totaling seven digits

7.5.5.2 Inter-NPA Call

This call type involves a call between two NANP subscribers in different NPA areas. The called number is as follows:

NPA + CO + Line Number (LN)

where:

NPA = 4 digit indicator within C.C. 1

CO = 3-4* digit indicator within the NPA

LN = 3-4* digit identifier within the CO code

i.e., 2972 + 718 + 6297

* variable field length option totaling seven digits

7.5.5.3 International Inbound Call

This call type involves a call from outside Country Code "1" to a NANP number. The called number is as follows:

International Prefix + CC + NPA + CO + Line Number (LN)

where:

International Prefix = "00" (International standard)

CC = 1 (International designation for the NANP)

NPA = 4 digit indicator within C.C. "1"

CO = 3-4* digit indicator within the NPA

LN = 3-4* digit identifier within the CO code

i.e., 00 + 1 + 2972 + 718 + 6297

* variable field length option totaling seven digits

7.5.6 Routing/Translation Implications

Routing decisions and the supporting translation logic to support this NANP Expansion option are based on the structure of the plan, and, the functionality associated with that structure. The dialing plan is also based on this. Note that there will be no change to the logic or analysis/translation requirements for this call type after implementation of the INC Uniform Dialing Plan. Therefore, the following routing/digit analysis logic applies.

7.5.6.1 Intra-NPA

The dialed digits (per paragraph 6.5.5.1) are:

NPA + CO + Line Number

The originating portion of the network (e.g., originating end office/first interexchange switch) will determine, based on originating line number, and, the absence of an international prefix; e.g., "011", and the analysis of the called NPA digits that the call type is "intra-NPA."

7.5.6.2 Inter-NPA

The introduction of an additional digit to the NPA code does not change the dialing methodology currently in place to place calls between NPAs.

The dialed digits (per paragraph 6.5.5.2) are:

NPA + CO + Line Number

The originating network switch (i.e., the originating end office, and/or, the initial interexchange switch) must recognize the absence of an international prefix; e.g., "011", and analysis of the called NPA digits and react accordingly.

Specifically, this requires:

- recognition that this is an inter-NPA call; i.e., not destined to the originating NPA
- recognition that this call type has eleven digits
- the call be sent to new and unique inter-NPA translation tables (logic), where:
 - digit analysis may be four (NPA) or seven digits (NPA + CO)
 - outpulsed (sent) digits may be seven (eleven-digit NANP number minus NPA), or, eleven (NANP number),
 - other requirements to be determined

It is implementation dependent how much logic is placed in the originating end office, versus, the interexchange switch, versus an "off-network" database.

7.5.6.3 International Inbound to NANP

The introduction of an additional NPA digit into the NANP number is consistent with existing international translation and routing requirements.

The dialed digits (per paragraph 6.5.5.3) are:

International Prefix + CC + NPA + CO + Line Number

Today (i.e., with CC + NANP number), analysis of the CC "1" plus the geographic NPA (NXX) is required to route accurately into the NANP. Using an NPA that consists of four digits increases the number of digits that require analysis by one digit. Since E.164 allows for seven-digit analysis the combined number of digits of the Country Code (one), the NPA (four) and the CO code (three or four) totals eight or nine, which exceeds this limit. Accordingly, expansion of the NANP format as proposed in this option suggests that the ITU Recommendation E.164 may need to be modified to specify eight or digit translation on certain international inbound calls to C.C. "1".

7.5.7 Transition Considerations

Option 2-A will require dialing a prefix during the permissive dialing period of transition. Since NPAs do not use "0" or "1" in the A digit, the use of a prefix in the "0" or "1" format will enable the network to determine whether a subscriber is dialing the existing or expanded format during transition.

During the permissive dialing period, calls to expanded NANP numbers will require dialing the prefix "1". Also during the permissive dialing period, the existing ten-digit NANP numbers could be dialed and completed using ten digits (i.e., 1 2972-444-1234 could be dialed and completed using 972-444-1234).

During the transition period, the new A digit is fixed (i.e., can only have a single value of "2"), therefore, all existing NPAs will be in the "2" + NPA format. After transition, the A digit will be released to the other values of N (i.e., "3" through "9").

The use of the prefix "1" for dialing the expanded NANP numbers could be eliminated after the permissive dialing period.

It is recommended that a six month permissive dialing period be used to effect a transition to the 2-A format.

7.6 Option 2-B – Four-Digit NPA With a New A Digit, D Digit Release, and Four-Digit CO Codes

Option 2-B involves the addition of a single digit to the NPA field in the NANP number. In addition, the existing ten-digit NANP number format is expanded to include four-digit Central Office codes. It is assumed that the new digit is added at the end of the existing three-digit CO code field.

7.6.1 Format/Layout

The new number format is as follows:

$$(N) NXX + XXX(X) + XXXX$$

where:

N = “2” through “9”

NPA = Four-digit field (N)NXX or (N)XXX, where (N) is the additional digit

XXX(X) = Four-digit field (Central Office code), where (X) is the additional digit

XXXX = Four-digit Line Number field

There are two sub-options available under option 2-B.

The first involves the release of the first digit in the existing NPA field from the current N restriction (i.e., “2” through “9”) to X, where X = “0” through “9”. The initial digit in the new NPA is always assumed to take on the N restriction (i.e., “2” through “9”).

The second involves the use of variable field lengths within the Central Office code plus line number field. The total length of this field would be fixed at eight digits, however, deployment could involve varying combinations [i.e., 3 + 5 (XXX + XXXXX); 4 + 4 (XXXX + XXXX); and/or 5 + 3 (XXXXX + XXX)].

Option 2-B was eliminated at INC45. The rationale for this elimination is in Annex B.

7.6.2 Capacity

The new NPA field [restricted to N format] provides an eightfold increase in the number of NANP resources. Therefore, assuming four-digit NPA codes in the NNXX format, the total number of NPAs available is 6,400 (i.e., 8 x 800). The sub-option of NPAs in the NXXX format provides a total of 8,000 NPAs (i.e., 8 x 1,000).

The addition of a new digit to the traditional CO code field, creates 10,000 CO codes behind each NPA code. The D digit (now E) is assumed to be in the X format. The new capacity is therefore:

(N)NXX + XXX(X) + XXXX; (8 x 800 x 10,000 x 10,000) = 640 billion,

or,

(N)XXX + XXX(X) + XXXX; (8 x 1,000 x 10,000 x 10,000) = 800 billion

Note: The capacity of the existing NANP in the NXX + NXX + XXXX format = 6.4 billion

7.6.3 Starting Point Assumptions

In addition to the basic NANP Expansion Assumptions listed in Section 2.0 of the NANP Expansion Report, the following "starting point" assumptions are made:

- the expansion plan will consist of two functional components; one to expand NPA capacity and one to mitigate NPA exhaust.
- both expansion plan components, as described above, will be implemented simultaneously (i.e., no "phased" expansion approach).
- the N (i.e., "2" through "9") restrictions will be removed from the CO code field.
- the conditions defined in the INC Uniform Dialing Plan will be implemented before the NANP Expansion Plan is. Specifically, the prefix "1" will be eliminated as a toll indicator, and, all intra-NANP calls will be dialed on a twelve-digit basis.

7.6.4 Functionality of NANP Number

The various fields of the new NANP number as defined in Section 6.6.1 above are assumed to support the following functionalities.

The NPA field will provide unique geographic location, or, service identification.

The CO code field will provide either service provider, or, geographic identification (or both) within the NPA from which they are assigned.

The line number field will provide the unique subscriber identification required within each CO code from which they are assigned.

7.6.5 Dialing Plan

The following dialing plan scenarios are predicated on the above assumptions. In all examples, the full international number assigned to the called NANP subscriber is assumed to be

1 + 2972 + 2718 + 6297;

where:

1 = country code
2972 = NPA Code
2718 = CO code
6297 = Line Number

7.6.5.1 Intra-NPA Call

This call type involves a call between two NANP subscribers in the same NPA Area. The called number is as follows:

NPA + CO + Line Number (LN)

where:

NPA = 4 digit indicator within C.C. "1"
CO = 3-5* digit indicator within the NPA Code
LN = 3-5* digit identifier within the CO code

i.e., 2972 + 2718 + 6297

* variable field length option totaling eight digits

7.6.5.2 Inter-NPA Call

This call type involves a call between two NANP subscribers in different NPAs. The called number is as follows:

NPA + CO + Line Number (LN)

where:

NPA = 4 digit NPA indicator within C.C. "1"
CO = 3-5* digit indicator within the NPA Code
LN = 3-5* digit identifier within the CO code

i.e., 2972 + 2718 + 6297

* variable field length option totaling eight digits

7.6.5.3 International Inbound Call

This call type involves a call from outside Country Code "1" to a NANP number. The called number is as follows:

International Prefix + CC + NPA + CO + Line Number (LN)

where:

International Prefix = "00" (international standard)

CC = 1 (international designation for the NANP)

NPA = 4 digit indicator within C.C. "1"

CO = 3-5* digit indicator within the NPA

LN = 3-5* digit identifier within the CO code

i.e., 00 + 1 + 2972 + 2718 + 6297

* variable field length option totaling eight digits

7.6.6 Routing/Translation Implications

Routing decisions and the supporting translation logic to support this NANP Expansion option are based on the structure of the plan, and, the functionality associated with that structure. The dialing plan is also based on this. Note that there will be no change to the logic requirements for this call type after implementation of the INC Uniform Dialing Plan (i.e., all ten-digit dialing). There will be two additional digits to analyze/translate.

Therefore, the following routing/digit analysis logic applies.

7.6.6.1 Intra-NPA

The dialed digits (per paragraph 6.6.1) are:

NPA + CO + Line Number (LN)

The originating portion of the network (e.g., originating end office/first interexchange switch) will determine that the call type is "intra-NPA." Analysis of the eight-digit NPA + CO will allow the call to be routed directly to an outgoing trunk group.

7.6.6.2 Inter-NPA

The dialed digits (per paragraph 6.6.5.2) are:

NPA + CO + Line Number (LN)

The originating network switch (i.e., the originating end office, and/or, the initial interexchange switch) must recognize the NPA and react accordingly.

Specifically, this requires:

- recognition that this is an inter-NPA call
- recognition that this call type has twelve digits

- the call be sent to new and unique inter-NPA translation tables (logic), where:
 - digit analysis may be four (NPA) or eight digits (NPA + CO), outpulsed (sent) digits may be eight (twelve-digit NANP number minus NPA), or twelve (Full NANP number)
 - other requirements to be determined

It is implementation dependent how much logic is placed in the originating end office, versus the interexchange switch, versus an off-network database.

7.6.6.3 International Inbound to NANP

The introduction of an additional NPA digit into the NANP number is consistent with existing international translation and routing requirements.

The dialed digits (per paragraph 6.6.5.3) are:

International Prefix + CC + NPA + CO + Line Number (LN)

Today (i.e., with CC + NANP number), analysis of the CC “1” plus the geographic NPA (NXX) is required to route accurately into the NANP. This is changed with this option given the two additional digits added to the new expanded NANP number. Since E.164 allows for seven-digit analysis, the combined number of digits of the Country Code (one) and the NPA (four) plus the three- to five-digit CO code totals eight to ten which exceeds this limit. Accordingly, expansion of the NANP format as proposed in this option suggests that the ITU Recommendation E.164 may need to be modified to specify eight to ten-digit translation on certain international inbound calls.

7.6.7 Transition Considerations

Option 2-B will require dialing a prefix during the permissive dialing period of transition. Since NPAs do not use “0” or “1” in the A digit, the use of a prefix in the “0” or “1” format will enable the network to determine whether a subscriber is dialing the existing or expanded format during transition.

During the permissive dialing period, calls to expanded NANP numbers will require dialing the prefix “1”. Also during the permissive dialing period, the existing ten-digit NANP numbers could be dialed and completed using ten digits (i.e., 1 2972-0444-1234 could be dialed and completed using 972-444-1234).

During the transition period, the new A digit is fixed (i.e., can only have a single value of “2”); therefore, all existing NPAs will be in the “2” + NPA format. After transition, the A digit will be released to the other values of N (i.e., “3” through “9”). Also during the transition period, the new E digit is fixed at 0 or 1; after transition, the new E digit will be released.

The use of the prefix “1” for dialing the expanded NANP numbers could be eliminated after the permissive dialing period.

It is recommended that a six month permissive dialing period be used to effect a transition to the 2-B format.

7.7 Option 2-C – Four-Digit NPA With a New A Digit and Five-Digit Line Number

Option 2-C was eliminated at INC39. The rationale for this elimination is in Annex B.

7.8 Option 3-A - NDC + NPA With D Digit Release

Option 3-A involves the addition of a single digit National Destination Code (NDC) field as a new field in the NANP number. In addition, the existing ten-digit NANP number capacity is expanded by releasing the D digit to take on X values (i.e., “0” through “9”). Note: The D digit is located in the E position with the introduction of a single digit NDC.

7.8.1 Format/Layout

The new NANP number format is as follows:

NDC + NPA + XXX+ XXXX

where:

N = “2” through “9”

NDC = New single digit field

NPA = Three-digit field (NXX or XXX)⁷

XXX = Three-digit field (Central Office code)

XXXX = Four-digit field

There are two sub-options available under Option 3-A.

The first involves the release of the first digit in the NPA field from the current N restriction (i.e., “2” through “9”) to X, where X = “0” through “9”. The NDC digit is always assumed to take on the N restriction (i.e., “2” through “9”).

The second involves the use of variable field lengths within the Central Office code plus line number field. The total length of this field would be fixed at seven digits, however, deployment could involve varying combinations [i.e., 3 + 4 (XXX + XXXX); 4 + 3 (XXXX + XXX)]; and/or 2 + 5 (XX + XXXXX).

7.8.2 Capacity

⁷ Where NPA = XXX a prefix would be required for intra-NDC calls to avoid confusion with 0+ calls

The new NDC field [restricted to N format] provides an eightfold increase in the number of NPA resources, as the full capacity of the NANP is deployable behind each NDC. Therefore, assuming three-digit NPA codes in the NXX format, the total number of NPAs available is 6,400 (i.e., 8 x 800). The sub-option of NPAs in the XXX format provides a total of 8,000 NPAs (i.e., 8 x 1000).

The release of the D digit creates 1,000 Central Office codes behind each NPA code. The new capacity is therefore:

$$\text{NDC} + \text{NXX} + \text{XXX} + \text{XXXX}; (8 \times 800 \times 1,000 \times 10,000) = 64 \text{ billion,}$$

or,

$$\text{NDC} + \text{XXX} + \text{XXX} + \text{XXXX}; (8 \times 1,000 \times 1,000 \times 10,000) = 80 \text{ billion}$$

Note: The capacity of the existing NANP in the NXX + NXX + XXXX format = 6.4 billion

7.8.3 Starting Point Assumptions

In addition to the basic NANP Expansion Assumptions listed in Section 2.0 of the NANP Expansion Report, the following "starting point" assumptions are made:

- the expansion plan will consist of two functional components; one to expand NPA capacity and one to mitigate NPA exhaust.
- both expansion plan components, as described above, will be implemented simultaneously (i.e., no "phased" expansion approach).
- the N (i.e., "2" through "9") restrictions will be removed from the CO code field.
- the conditions defined in the INC Uniform Dialing Plan will be implemented before the NANP Expansion Plan is implemented. Specifically, the prefix "1" will be eliminated as a toll indicator, and, all intra-NANP calls will be dialed on a ten-digit basis.

7.8.4 Functionality of NANP Number

The various fields of the new NANP number as defined in Section 6.8.1 above are assumed to support the following functionalities.

The NDC field will provide a means of dividing the NANP serving area into unique geographic Sectors. Each Sector will have the potential to support the full capacity of the ten or eleven-digit NANP numbering plan which follows the NDC.

The recommendation is to allocate the NDCs as follows:

- 0 - protected/unassignable
- 1 - protected/ unassignable

- 2 - CANADA (geographic NPAs only)
- 3 - USA (geographic NPAs only)*
- 4 - USA (geographic NPAs only)*
- 5 - USA (geographic NPAs only)*
- 6 - USA (geographic NPAs only)*
- 7 - SAC/ERC (including all non-geographic NPAs) Full NANP Serving Area
- 8 - spare/growth
- 9 - spare/growth

* NDCs “3” through “6” may be allocated to specific USA geographic sectors, or overlaid sectors, or both. The Caribbean countries would be included in one of these sectors.

Each Sector will have the potential to support the full capacity of the ten-digit NANP numbering plan which follows the NDC.

The NPA field will provide unique geographic location, or, service identification within each NDC Sector.

The CO code field will provide either service provider identification or geographic location (or both) within the NPA from which they are assigned.

The line number field will provide the unique subscriber or terminal identification required within each CO code from which they are assigned.

7.8.5 Dialing Plans

The following dialing plan scenarios are predicated on the above assumptions. In all examples, the full international number assigned to the called NANP subscriber is assumed to be 1 + 2 + 613 + 259 + 5000; where 1 = country code, 2 = NDC, 613 = NPA, 259 = CO code, 5000 = line number.

7.8.5.1 Intra-NDC Call

This call type involves a call between two NANP subscribers in the same NDC Sector. The called number is as follows:

NPA + CO + Line Number (LN)

where:

NPA = 3 digit indicator within the NDC
CO = 3-4* digit indicator within the NPA
LN = 3-4* digit identifier within the CO code

i.e., 613 + 259 + 5000

* variable field length option totaling seven digits

7.8.5.2 Inter-NDC Call

This call type involves a call between two NANP subscribers in different NDC Sectors. The called number is as follows:

NDC Prefix + NDC + NPA + CO + Line Number (LN)

where:

NDC Prefix = NANP Prefix signaling NDC to follow (assume 1)

NDC = single-digit geographic indicator within the NANP

NPA = 3 digit indicator within the NDC

CO = 3-4* digit indicator within the NPA

LN = 3-4* digit identifier within the CO code

i.e., 1 + 2 + 613 + 259 + 5000

* variable field length option totaling seven digits

7.8.5.3 International Inbound Call

This call type involves a call from outside Country Code 1 to a NANP number. The called number is as follows:

International Prefix + CC + NDC + NPA + CO + Line Number (LN)

where:

International Prefix = "00" (international standard)

CC = "1" (international designation for the NANP)

NDC = single-digit geographic indicator within the NANP

NPA = 3 digit indicator within the NDC

CO = 3-4* digit indicator within the NPA

LN = 3-4* digit identifier within the CO code

i.e., 00 + 1 + 2 + 613 + 259 + 5000

* variable field length option totaling seven digits

7.8.6 Routing/Translation Implications

Routing decisions and the supporting translation logic to support this NANP Expansion option are based on the structure of the plan, and, the functionality associated with that structure. The dialing plan is also based on this, and is designed to keep the number of digits dialed to those digits actually required to translate and route each call. Therefore, the following routing/digit analysis logic applies.

7.8.6.1 Intra-NDC

The dialed digits (per paragraph 6.8.5.1) are:

NPA + CO + Line Number (LN)

The originating portion of the network (e.g., originating end office/first interexchange switch) will determine, based on originating line number, and, the absence of an international or inter-NDC prefix that the call type is "intra-NDC". Analysis of the six-digit NPA + CO will allow the call to be routed directly to an outgoing trunk group. Note that there will be no change to the logic or analysis/translation requirements for this call type after implementation of the INC Uniform Dialing Plan (i.e., all ten-digit dialing).

7.8.6.2 Inter-NDC

The introduction of the NDC functionality and the new single-digit field in NANP creates a need for new capabilities including prefix recognition, digit analysis, and translation logic.

It is assumed that this expansion option will require the introduction of a new prefix to allow the network to distinguish between NDCs in the "2" through "9" range, and, NPAs in "2" through "9", or, "0" through "9" range.

The dialed digits (per paragraph 6.8.5.2) are:

NDC Prefix + NDC + NPA + CO + Line Number (LN)

The originating network switch (i.e., the originating end office, and/or, the initial interexchange switch) must recognize the NDC prefix and react accordingly.

Specifically, this requires:

- recognition that this is an inter-NDC call
- recognition that this call type has eleven digits
- the call be sent to new and unique inter-NDC translation tables (logic), where:
 - digit analysis may be one (NDC), four (NDC + NPA) or seven digits (NDC + NPA + CO)
 - outpulsed (sent) digits may be seven (eleven-digit NANP number minus NDC + NPA), or, ten (NANP number minus NDC), or, eleven digits (Full NANP number)
 - other requirements to be determined

It is implementation dependent how much logic is placed in the originating end office, versus the interexchange switch, versus an "off-network" database.

7.8.6.3 International Inbound to NANP

The introduction of a geographic based NDC functionality into the NANP number has the potential to simplify international translation and routing requirements.

The dialed digits (per paragraph 6.8.5.3) are:

International Prefix + CC + NDC + NPA + CO + Line Number (LN)

Today (i.e., with CC + NANP number), analysis of the CC “1” plus the geographic NPA (NXX) is required to route accurately into the NANP. Calls to certain non-geographic numbers (i.e., SACs) require seven-digit analysis (i.e., CC + NPA + NXX) to route properly. Additionally, calls to NANP numbers, which require a North American database lookup to determine routing information (i.e., 800, 888, etc.), can not be routed accurately today.

Option 3-A, utilizing a geographic sector assignment strategy, requires the international network to analyze only two digits (i.e., CC + NDC) to accurately route all calls to a geographic NANP number.

Note that carrier selection capabilities, which are supported by techniques outside the NANP number (i.e., equal access), are still not available for international inbound routing under this expansion option (or any other) and therefore additional translation (i.e., five or eight digits) may be required to ensure direct routing to specific North American carriers from the originating international network.

7.8.7 Transition Considerations

In this option, intra-NDC calls (i.e., calls remaining in the NDC area of the calling party, Home-NDC calls) are dialed with no change to the pre-expansion dialing procedures (i.e., NPA XXX XXXX). Inter-NDC calls (i.e., calls going to a different NDC area than the calling party's, F (Foreign)-NDC calls) are dialed with a prefix (assume “1”), followed by the F-NDC digit (i.e., PFX + F-NDC + NPA XXX XXXX or 1 + 2 + 202 023 4567).

During both the permissive dialing period and permanently thereafter, the switching equipment in each NDC area would maintain a listing of the NPAs that are working in the H-NDC area. Calls to H-NDC NPAs would be routed on a ten-digit basis. Calls to F-NDC NPAs (i.e., those NPAs not on the H-NDC NPA list) would require the prefix plus the F-NDC. During the permissive dialing/transition period, there would be no duplication of NPA assignment within the NDCs, and translation techniques would be used to either route calls or provide informative announcements to users.

It is recommended that a six-month permissive dialing period be used to effect a transition to the 3-A format.

7.9 Options 3-B - NDC + NPA With Four-Digit CO Codes

Option 3-B involves the addition of a single digit National Destination Code (NDC) as a new field in the NANP number. In addition, the existing ten-digit NANP number capacity is expanded to include four-digit Central Office codes. It is assumed that the new digit is added at the end of the existing three-digit CO code field.

Option 3-B was eliminated at INC45. The rationale for this elimination is in Annex B.

7.9.1 Format/Layout

The new number format is as follows:

NDC + NPA + XXX(X) + XXXX

where:

N = "2" through "9"

NDC = New single-digit field

NPA = Three-digit field (NXX or XXX)⁸

XXX(X) = Four-digit field (Central Office code), where (X) is the additional digit

XXXX = Four-digit field

There are two sub-options available under Option 3-B.

The first involves the release of the first digit in the NPA field from the current N restriction (i.e., "2" through "9") to X, where X = "0" through "9". The NDC digit is always assumed to take on the N restriction (i.e., "2" through "9").

The second involves the use of variable field lengths within the Central Office code plus line number field. The total length of this field would be fixed at eight digits, however, deployment could involve varying combinations [i.e., 3 + 5 (XXX + XXXXX); 4 + 4 (XXXX + XXXX); and/or 5 + 3 (XXXXX + XXX)].

7.9.2 Capacity

The new NDC field [restricted to N format] provides an eightfold increase in the number of NPA resources, as the full capacity of the NANP is deployable behind each NDC. Therefore, assuming three-digit NPA codes in the NXX format, the total number of NPAs available is 6,400 (i.e., 8 x 800). The sub-option of NPAs in the XXX format provides a total of 8,000 NPAs (i.e., 8 x 1,000).

The addition of a new digit to the traditional CO code field creates 10,000 CO codes behind each NPA code. The D digit (now E) is assumed to be in the X format. The new capacity is therefore:

NDC(N) + NXX + XXX(X) + XXXX; (8 x 800 x 10,000 x 10,000) = 640 billion,

⁸ Where NPA = XXX a prefix would be required for intra-NDC calls to avoid confusion with 0+ calls

or,

$$\text{NDC(N)} + \text{XXX} + \text{XXX(X)} + \text{XXXX}; (8 \times 1,000 \times 10,000 \times 10,000) = 800 \text{ billion}$$

Note: The capacity of the existing NANP in the NXX + NXX + XXXX format = 6.4 billion

7.9.3 Starting Point Assumptions

In addition to the basic NANP Expansion Assumptions listed in Section 2.0 of the NANP Expansion Report, the following "starting point" assumptions are made:

- the expansion plan will consist of two functional components; one to expand NPA capacity and one to mitigate NPA exhaust.
- both expansion plan components, as described above, will be implemented simultaneously (i.e., no "phased" expansion approach).
- the N (i.e., "2" through "9") restrictions will be removed from the CO code field.
- the conditions defined in the INC Uniform Dialing Plan will be implemented before the NANP Expansion Plan is! Specifically, the prefix "1" will be eliminated as a toll indicator, and, all intra-NANP calls will be dialed on a ten-digit basis.

7.9.4 Functionality of NANP Number

The various fields of the new NANP number as defined in Section 6.9.1 above are assumed to support the following functionalities.

The NDC field will provide a means of dividing the NANP serving area into unique geographic Sectors. Each Sector will have the potential to support the full capacity of the ten or eleven-digit NANP numbering plan which follows the NDC.

The recommendation is to allocate the NDCs as follows:

- 0 - protected/unassignable
- 1 - protected/ unassignable
- 2 - CANADA (geographic NPAs only)
- 3 - USA (geographic NPAs only)*
- 4 - USA (geographic NPAs only)*
- 5 - USA (geographic NPAs only)*
- 6 - USA (geographic NPAs only)*
- 7 - SAC/ERC (including all non-geographic NPAs) Full NANP Serving Area
- 8 - spare/growth
- 9 - spare/growth

* NDCs “3” through “6” may be allocated to specific USA geographic sectors, or overlaid sectors, or both. The Caribbean countries would be included in one of these sectors.

Each Sector will have the potential to support the full capacity of the ten-digit NANP numbering plan which follows the NDC.

The NPA field will provide unique geographic location, or, service identification within each NDC Sector.

The CO code field will provide either service provider identification or geographic location (or both) within the NPA from which they are assigned.

The line number field will provide the unique subscriber or terminal identification required within each CO code from which they are assigned.

7.9.5 Dialing Plans

The following dialing plan scenarios are predicated on the above assumptions. In all examples, the full international number assigned to the called NANP subscriber is assumed to be 1 + 2 + 613 + 2590 + 5000; where 1 = country code, 2 = NDC, 613 = NPA, 2590 = CO code, 5000 = line number.

7.9.5.1 Intra-NDC Call

This call type involves a call between two NANP subscribers in the same NDC Sector⁹.

The called number is as follows:

NPA + CO + Line Number (LN)

where:

NPA = 3 digit indicator within the NDC
CO = 3-5* digit indicator within the NPA
LN = 3-5* digit identifier within the CO code

i.e., 613 + 2590 + 5000

* variable field length option totaling eight digits

7.9.5.2 Inter-NDC Call

⁹ The ability of wireless customers to dial a call on an intra-NDC basis as described herein depends upon the NDCs assigned to the calling and called parties and/or the physical location of the parties at the time of the call.

This call type involves a call between two NANP subscribers in different NDC Sectors. The called number is as follows:

NDC Prefix + NDC + NPA + CO + Line Number (LN)

where:

NDC Prefix = NANP Prefix signaling NDC to follow (assume 1)

NDC = single-digit geographic indicator within the NANP

NPA = 3 digit indicator within the NDC

CO = 3-5* digit indicator within the NPA

LN = 3-5* digit identifier within the CO code

i.e., 1 + 2 + 613 + 2590 + 5000

* variable field length option totaling eight digits

7.9.5.3 International Inbound Call

This call type involves a call from outside Country Code "1" to a NANP number. The called number is as follows:

International Prefix + CC + NDC + NPA + CO + Line Number (LN)

where:

International Prefix = "00" (international standard)

CC = "1" (international designation for the NANP)

NDC = single-digit geographic indicator within the NANP

NPA = 3 digit indicator within the NDC

CO = 3-5* digit indicator within the NPA

LN = 3-5* digit identifier within the CO code

i.e., 00 + 1 + 2 + 613 + 2590 + 5000

* variable field length option totaling eight digits

7.9.6 Routing/Translation Implications

Routing decisions and the supporting translation logic to support this NANP Expansion option are based on the structure of the plan, and, the functionality associated with that structure. The dialing plan is also based on this, and is designed to keep the number of digits dialed to those digits actually required to translate and route each call. Therefore, the following routing/digit analysis logic applies.

7.9.6.1 Intra-NDC

The dialed digits (per paragraph 6.9.5.1) are:

NPA + CO + Line Number (LN)

The originating portion of the network (e.g., originating end office/first interexchange switch) will determine, based on originating line number, and, the absence of an international or inter-NDC prefix that the call type is "intra-NDC". Analysis of the six-digit NPA + CO will allow the call to be routed directly to an outgoing trunk group. Note that there will be no change to the logic or analysis/translation requirements for this call type after implementation of the INC Uniform Dialing Plan (i.e., all ten-digit dialing).

7.9.6.2 Inter-NDC

The introduction of the NDC functionality and the new single-digit field in NANP creates a need for new capabilities including prefix recognition, digit analysis, and translation logic. It is assumed that this expansion option will require the introduction of a new prefix to allow the network to distinguish between NDCs in the "2" through "9" range, and, NPAs in "2" through "9", or, "0" through "9" range.

The dialed digits (per paragraph 6.9.5.2) are:

NDC Prefix + NDC + NPA + CO + Line Number (LN)

The originating network switch (i.e., the originating end office, and/or, the initial interexchange switch) must recognize the NDC prefix and react accordingly.

Specifically, this requires:

- recognition that this is an inter-NDC call
- recognition that this call type has twelve digits
- the call be sent to new and unique inter NDC translation tables (logic), where:
 - digit analysis may be one (NDC), four (NDC + NPA) or eight digits (NDC + NPA + CO)
 - outpulsed (sent) digits may be eight (twelve-digit NANP number minus NDC + NPA), or, eleven (NANP number minus NDC), or, twelve (Full NANP number)
 - other requirements to be determined

It is implementation dependent how much logic is placed in the originating end office, versus, the interexchange switch, versus an off-network database.

7.9.6.3 International Inbound to NANP

The introduction of a geographic based NDC functionality into the NANP number has the potential to simplify international translation and routing requirements.

The dialed digits (per paragraph 6.9.5.3) are:

International Prefix + CC + NDC + NPA + CO + Line Number (LN)

Today (i.e., with CC + NANP number), analysis of the CC “1” plus the geographic NPA (NXX) is required to route accurately into the NANP. Calls to certain non-geographic numbers (i.e., SACs) require seven-digit analysis (i.e., CC + NPA + NXX) to route properly. Additionally, calls to NANP numbers, which require a North American database lookup to determine routing information (i.e., 800, 888, etc.), can not be routed accurately today.

Option 3-B, utilizing a geographic sector assignment strategy, requires the international network to analyze only two digits (i.e., CC + NDC) to accurately route all calls to a geographic NANP number.

Note that carrier selection capabilities, which are supported by techniques outside the NANP number (i.e., equal access), are still not available for international inbound routing under this expansion option (or any other) and therefore additional translation (i.e., five or eight digits) may be required to ensure direct routing to specific North American carriers in the originating international network.

7.9.7 Transition Considerations

In this option, intra-NDC calls (i.e., calls remaining in the NDC area of the calling party, Home-NDC calls) are transitioned by adding a new D digit of 0 to the existing ten-digit numbers (i.e., NPA 0NXX XXXX). Inter-NDC calls (i.e., calls going to a different NDC area than the calling party's, Foreign-NDC calls) are dialed with a prefix (assume “1”), followed by the F-NDC digit, the NPA and new four-digit CO code (i.e., PFX + F-NDC + NPA 0XXX XXXX or 1 + 2 + 202 0223 4567).

During both the permissive dialing period and permanently thereafter, the switching equipment in each NDC area would maintain a listing of the NPAs that are working in the H-NDC area. Calls to H-NDC NPAs would be routed on a eleven-digit basis. Calls to F-NDC NPAs (i.e., those NPAs not on the H-NDC NPA list) would require the prefix plus the F-NDC. During the permissive dialing/transition period, there would be no duplication of NPA assignment within the NDCs, and translation techniques would be used to either route calls or provide informative announcements to users.

It is recommended that a six-month permissive dialing period be used to effect a transition to the 3-B format.

7.10 Option 3-C – NDC + NPA With Five-Digit Line Numbers

NDC + NPA with five-digit line numbers was eliminated at INC 39. The rationale for this elimination is in Annex B.

7.11 Option 4-A – Four-Digit NPA With a New B Digit and D Digit Release

The fields of this expanded structure are consistent with the fields defined in the current NANP structure and, therefore, support the same functionalities. All “Phase 1” options expand the structure of the numbers available in the NANP with the use of an additional digit to the area code (NPA) and the modification or addition of the digit fields that define the Central Office code or line number. Specifically, all “Phase 1” options append a digit to the area code generating an NPA field of the form NXXX. Further, Option 4-A releases the D digit, the first digit of the Central Office code in the current NANP structure, to allow the use of the digits “0” or “1” in addition to the currently available digits “2” through “9”.

7.11.1 Format/Layout

Option 4-A adds a fourth digit (a new B digit) to the area code field and uses a released D digit to allow the use of the digits “0” or “1” (in addition to digits “2” through “9”) as the first digit in the Central Office code field. The number format for this option is as follows:

N(X)XX + XXX + XXXX

where N represents digits “2” through “9”, X represents digits “0” through “9”, and:

N(X)XX = a four-digit NPA with (X) the additional digit

XXX = a three-digit Central Office code with a released D digit

XXXX = a four-digit line number

For example: 972 NXX XXXX becomes 9972 XXX XXXX

 202 NXX XXXX becomes 2902 XXX XXXX

 613 NXX XXXX becomes 6913 XXX XXXX

 514 NXX XXXX becomes 5914 XXX XXXX

Non-Geographic NPAs would be changed as follows:

 800 NXX XXXX becomes 8900 XXX XXXX

 900 NXX XXXX becomes 9900 XXX XXXX

Special Use Codes would be dialed as follows:

 N11 codes would stay N11

 950 XXXX would stay 950 XXXX

 202 555 1212 would change to 2902 555 1212

555 XXXX would stay 555 XXXX

7.11.2 Capacity

The existing NANP format (NXX + NXX + XXXX) mathematically provides 6.4 billion numbers (800 x 800 x 10,000). Option 4-A increases the number of available area codes from 800 to 8000 and the number of available Central Office codes from 800 to 1000. The mathematical quantity of numbers available with this option is therefore:

$$N(X)XX + XXX + XXXX; (8,000 \times 1,000 \times 10,000) = 80 \text{ billion}$$

Option 4-A therefore provides approximately a twelve fold increase in capacity relative to the existing NANP structure. Importantly, within each NPA, the quantity of numbers is increased by two million.

7.11.3 Starting Point Assumptions

In addition to the basic NANP Expansion Assumptions listed in Section 2.0 of the NANP Expansion Report, the following "starting point" assumptions are made:

- the expansion plan will consist of two functional components; one to expand NPA capacity and one to mitigate NPA exhaust.
- both expansion plan components, as described above, will be implemented simultaneously (i.e., no "phased" expansion approach).
- the N (i.e., "2" through "9") restrictions will be removed from the CO code field.
- the conditions defined in the INC Uniform Dialing Plan will be implemented before the NANP Expansion Plan is implemented. Specifically, the prefix "1" will be eliminated as a toll indicator, and, all intra-NANP calls will be dialed on a ten-digit basis.

7.11.4 Functionality of NANP Number

The fields of this expanded structure are consistent with the fields defined in the current NANP structure and, therefore, support the same functionalities.

The area code or NPA field designates a particular geographic area to which the number is assigned. In addition, the NPA could be used to identify a specific service for which the subtending numbers are designated (e.g., a Service Access Code or Easily Recognizable Code) Each NPA can support the full capacity of the seven-digit number which follows the NPA code.

The Central Office code field further defines the geographic area within the NPA where the number is assigned. Absent porting and pooling, the Central Office code field could identify the specific switch from which the subscriber assigned the

number is served. If service provider number portability and/or number pooling is available the Central Office code field would identify the rate center in which the subscriber is served. If the NPA is designated as a non-geographic SAC or ERC to be shared among service providers, and number portability is not available for the designated service, the associated Central Office codes associated with that NPA could be used to identify specific service providers.

The line number field uniquely identifies the subscriber or terminal assigned the number.

7.11.5 Dialing Plan

A uniform dialing plan, consistent with the concept proposed in the INC Uniform Dialing Plan recommendation could be used for all "Series 1" options. Specifically, this dialing arrangement would require all calls, inter-NPA and intra-NPA, both local and toll to be dialed using the full dialing string; that is eleven digits. No prefix (i.e., "1") would be required for direct dialed and direct billed calls. Calls requiring operator assistance or alternative billing would be dialed "0"+. The need for toll indication to the calling party, if mandated by regulatory directive, could be provided by the network, in the form of a tone or announcement.

On international calls inbound to the NANP area, the dialing plan will consist of the international access code followed by the (NANP) country code "1" and the full eleven-digit NANP number.

7.11.6 Routing/Translation Implications

Information embedded in the dialed number will be used by network switches to appropriately process and route the call. Whatever digit analysis scheme the SP currently uses, it will increase in complexity by one digit. It should be recognized that routing/translation implications are, in general, common to all options in "Series 1."

Finally, in an environment which supports number portability and number pooling, call routing will be dependent on the identification, within the (N-1) network in the call path, of the dialed number as a ported or pooled code, and the use of the necessary portability related call processing. Identification of the dialed number as a ported code will typically require analysis of all eleven digits.

Within the current ten-digit NANP structure, proper routing of certain inbound international calls requires seven-digit analysis and translation by the originating carrier (i.e., the carrier outside the NANP). Such treatment, which is consistent with existing ITU Recommendation E.164, permits analysis of the country code, area code and Central Office code of the dialed NANP number. Expansion of the NANP format as proposed in Option 4-A suggests that the ITU recommendation may need to be modified to specify eight-digit translation on these calls.

7.11.7 Transition Considerations

Adding the new fourth digit “9” in the second position of the NPA code facilitates transition to the expanded Option 4-A format. Since NPA codes in the format of N9X are reserved for NANP expansion, there are no existing NPAs with a “9” in the second-digit position. Transition would be accomplished by changing all existing three-digit NPA codes to four-digit NPA codes by adding the digit “9” as the new second digit. Use of the digit “9” in the second position of the expanded NPAs will enable switches to determine whether the caller is dialing a ten-digit or eleven-digit number.

At the end of the transition period, four-digit NPA codes using the X format in the second-digit position will be assigned.

It is recommended that a six month permissive dialing period be used to effect a transition to the 4-A format.

7.12 Option 4-B – Four-Digit NPA With a New B Digit, D Digit Release and Four-Digit CO Codes

This option was eliminated at INC 45. The rationale for this elimination is in Annex B.

8.0 NANP Expansion Plan Description as Documented in the INC Report Titled “Recommended Plan for Expanding Capacity of the NANP”

The INC recommends expanding the format of the NANP by adding two additional digits, one digit to the NPA field and one digit to the Central Office code field. The current ten-digit NANP can be expanded to twelve digits by three different transition methods. This allows for the greatest flexibility in selecting the method of expansion and provides the industry a long-term direction on how to plan for NANP expansion.

Since it is possible to implement the two-digit format changes in separate phases, policy-makers may choose to implement only one digit of the expansion until necessity requires more. In any case, the transition options offer policy-makers flexibility in addressing the many considerations associated with such a significant change.

8.1 Recommended NANP Expansion Plan Format

The INC Recommended NANP Expansion Plan adds a fourth digit to the end of the NPA field and an additional digit to the beginning of the Central Office code field, resulting in a twelve-digit numbering plan. The expanded format will be as follows:

$$\text{NXX(X)} + \text{(X)NXX} + \text{XXXX}$$

where:

NXX (X) = a four-digit NPA with (X) the additional digit

(X)NXX = a four-digit Central Office code with (X) the additional digit

XXXX = a four-digit line number

Here, the values,

N represents digits 2 through 9, and

X represents digits 0 through 9,

Note: The new F digit (sixth digit of the expanded plan) takes on the values of 2 through 9 to allow a future expansion effort if and when needed.

8.1.1 Plan Capacity

The existing NANP format (NXX NXX XXXX) provides 6.4 billion numbers (800 x 800 x 10,000). The expansion plan increases the number of NPAs from 800 to 8,000 and the number of Central Office codes from 800 to 8,000. The quantity of numbers available with this option is therefore:

$$\text{NXX(X)} + \text{(X) NXX} + \text{XXXX} = (8,000 \times 8,000 \times 10,000) = 640 \text{ billion}$$

The expansion plan contains approximately a 100-fold increase in the quantity of available numbers relative to the existing NANP’s total of 6.4 billion. Within each

NPA, the addition of 7,200 Central Office codes increases the quantity of numbers in the NPA by 72 million.

8.1.2 Dependencies and Prerequisites

The INC recommended NANP expansion plan requires that ten-digit dialing be implemented within all parts of the NANP prior to expansion. This is necessary so that additional digits can be added to the end of the NPA and the beginning of the CO code (NXX) thereby creating a four-digit NPA Code and a four-digit CO code. The current uses of the prefixes 0 and 1 will still be available.

The expansion plan also requires that the present (historic) D digit not be released prior to NANP expansion. This is necessary so that during the transition both the existing and expanded NANP can be dialed and the network can determine whether the caller has dialed a ten-digit TN, an eleven-digit TN, or a twelve-digit TN by the analysis of the historic D digit.¹⁰

The following sections present a detailed discussion on three alternative transition methodologies:

8.2 Transition Method 1 (Both Digits Implemented Simultaneously)

Transition Method 1 adds two digits to the NANP at the same time. The ten-digit NANP number would be expanded to twelve digits during a single transition. The final expansion format would be:

NXX(X) + (X) NXX + XXXX

To achieve that transition, we start from the existing NANP:

NXX + NXX + XXXX

Examples of the current ten-digit NANP format transitioning to the twelve-digit expanded NANP format numbers are shown below.

Geographic numbers would be changed as follows:

972-NXX-XXXX becomes 9720-0NXX-XXXX

202-NXX-XXXX becomes 2020-0NXX-XXXX

613-NXX-XXXX becomes 6130-0NXX-XXXX

514-NXX-XXXX becomes 5140-0NXX-XXXX

¹⁰ A rejected approach was to implement a timing period after the completion of dialing to determine if the dialing of the number is complete. This approach was unacceptable due to post dial delays on all telephone calls dialed with the old format.

Non-Geographic numbers would be changed as follows:

800-NXX-XXXX becomes 8000-0NXX-XXXX

900-NXX-XXXX becomes 9000-0NXX-XXXX

Special Use Codes would be affected as follows:

N11 codes would remain N11¹¹

950-XXXX would remain 950-XXXX

202-555-1212 would change to 2020-0555-1212

8.2.1 Transition to Expanded NANP Using Method 1

During the transition period (one year) both the new and old plans need to be supported. The values of the fourth digit in the existing ten-digit NANP (historic D digit) cannot be a 0 or 1. Using the 0 or 1 value in the D digit position will provide the necessary indication for all switching equipment and operational support systems to ensure identification of an expanded twelve-digit NANP number. Method 1 could potentially be implemented with the new fourth digit of the NPA being either 0 or 1 allocated for Canada's exclusive and permanent use. During the transition period, only the value 0 or 1 can be used in the fourth position to differentiate the new from the old plan throughout the NANP. All non-geographic NPAs will be assigned a new fourth digit, either 0 or 1, across the entire NANP area. The allocation of the specific digits is unresolved. After transition, the values 2-9 will be assigned for growth.

Expansion is facilitated by adding the digits (00, 01, 10, 11) in the fourth and fifth positions of a ten-digit NANP number, immediately after the existing three-digit NPA, except for special use codes. Once the switching system has determined that the end user dialed an existing ten-digit number, the switch can be instructed to insert the appropriate combination in the fourth and fifth digit positions and forward this number on to subsequent switching systems. Signaling and billing systems can be arranged to transition to the twelve-digit NANP number long before the customers need to dial the twelve-digit number.

During the permissive dialing period, network switches will be able to determine whether the caller was dialing a ten-digit or twelve-digit number by checking the value of the D digit.

It is recommended that a one-year permissive dialing period be used to effect a transition. After the transition period is over, four-digit NPA codes and four-digit CO

¹¹ However, should the subscriber dial N110 or N111, the results will be the same as if N11 was dialed.

codes can then be assigned using other digit values (2-9) in the fourth and fifth digits.

8.3 Transition Method 2 (Phased Approach With NPA Implemented First)

Transition Method 2 first adds a fourth digit to the end of the NPA code and then at a later date adds an additional digit to the beginning of the CO code field. The ten-digit NANP number would be expanded to eleven digits during the first transition phase. The eleven-digit number would be subsequently expanded to twelve digits during a second transition phase at some later date.

To achieve this transition, we start from the existing NANP:

NXX + NXX + XXXX

We then go through an intermediate eleven-digit phase:

NXX (X) + NXX + XXXX

Before reaching the final expansion format:

NXX(X) + (X)NXX + XXXX

Examples of the current ten-digit NANP format transitioning to the twelve-digit Method 2 expanded NANP format numbers are shown below.

Geographic numbers would be changed as follows:

972-NXX-XXXX becomes 9720-NXX-XXXX after the first transition phase, then 9720-NXX-XXXX becomes 9720-0NXX-XXXX after the second transition phase.

202-NXX-XXXX becomes 2020-NXX-XXXX after the first transition phase, then 2020-NXX-XXXX becomes 2020-0NXX-XXXX after the second transition phase.

Non-Geographic numbers would be changed as follows:

800-NXX-XXXX becomes 8000-NXX-XXXX after first transition phase, then 8000-NXX-XXXX becomes 8000-0NXX-XXXX after the second transition phase

888-NXX-XXXX becomes 8880-NXX-XXXX after first transition phase, then 8880-NXX-XXXX becomes 8880-0NXX-XXXX after the second transition phase

Special Use Codes would be affected as follows:

N11 codes would remain N11¹²

950-XXXX would remain 950-XXXX

202-555-1212 would change to 2020-555-1212 then change to 2020-0555-1212

8.3.1 Transition to Expanded NANP Using Method 2

The fourth digit in the existing ten-digit NANP cannot be a 0 or 1. Using the 0 or 1 digit in the D digit position will provide the necessary indication for all switching equipment and operational support systems to ensure identification of an expanded eleven-digit NANP number during the first transition period. Also before the first transition phase occurs, all numbers must be dialed on a ten-digit basis. During the first transition phase both ten- and eleven-digit numbers must be supported.

Step one transitioning is enabled by adding the digit 0 or 1 as the fourth digit of the NPA code, except for special use codes. Once the switching system has determined that the end user dialed an existing ten-digit number, the switch can be instructed to insert a 0 or 1 in the fourth digit position and forward this number on to subsequent switching systems. It is recommended that the initial transition phase be one year.

Method 2 could potentially be implemented with the new fourth digit of the NPA being either 0 or 1 allocated for Canada's exclusive and permanent use. During the transition period, only the value 0 or 1 can be used in the fourth position to differentiate the new from the old plan throughout the NANP. All non-geographic NPAs will be assigned a new fourth digit, either 0 or 1, across the entire NANP area. The allocation of the specific digits is unresolved. After transition, the values 2-9 will be assigned for growth.

After this first transition, although it will be possible to have a 0 in the fourth digit, there will be an E digit restriction that blocks the fifth digit from taking on the values of 0 or 1 in the new eleven-digit number.

Phase two transitioning is enabled by adding the 0 or 1 as the first digit of the new four-digit CO code. Since the restriction barring the use of the digits 0 and 1 in the first digit remains, using the 0 digit as the new first digit of the expanded CO code field will enable switching systems to determine if an eleven or twelve-digit number has been dialed.

Signaling and billing systems can be arranged to transition to the eleven-digit and then a twelve-digit NANP number long before the customers need to dial the eleven-digit number and then the twelve-digit number.

¹² However, should the subscriber dial N110 or N111, the results will be the same as if N11 was dialed.

During the permissive dialing periods, network switches will be able to determine whether the caller was dialing an expanded format or non-expanded number by checking the value of the D and E digits.

It is recommended that the transition period for phase two also be one year. At the end of the transition period, digits other than 0 or 1 can be assigned in the expanded digit fields.

It is also recommended that there be an interval of not less than several decades between the end of the step one transition period and the beginning of the step-two transition period.

8.4 Transition Method 3 (Phased Approach with CO Code Implemented First)

Transition Method 3 first adds a digit to the beginning of the CO code field and then at a later date adds a digit to the end of the NPA. The ten-digit NANP number would first be expanded to eleven digits during the first transition phase by adding a 0 to the beginning of the CO code. The eleven-digit NANP number would then be expanded to twelve digits during a second transition phase by adding a 1 to end of the NPA.

To achieve this transition, we start from the existing NANP:

$NXX + NXX + XXXX$

We then go through an intermediate eleven-digit phase:

$NXX + (Y)NXX + XXXX$ where $Y = 0,2-9$

And then transition to the final expansion format with the following configuration:

$NXX(X) + (X)NXX + XXXX$

Examples of the current ten-digit NANP format transitioning to the twelve-digit Method 3 expanded NANP format numbers are shown below.

Geographic numbers would be changed as follows:

972-NXX-XXXX becomes 972-0NXX-XXXX after the first transition phase, then 972-0NXX-XXXX becomes 9721-0NXX-XXXX after the second transition phase

202-NXX-XXXX becomes 202-0NXX-XXXX after the first transition phase, then 202-0NXX-XXXX becomes 2021-0NXX-XXXX after the second transition phase

Non-Geographic NPAs would be changed as follows:

800-NXX-XXXX becomes 800-0NXX-XXXX after the first transition phase,
then 800-0NXX-XXXX becomes 8001-0NXX-XXXX after the second transition
phase

888-NXX-XXXX becomes 888-0NXX-XXXX after the first transition phase,
then 888-0NXX-XXXX becomes 8881-0NXX-XXXX after the second transition
phase

Special Use Codes would be affected as follows:

N11 codes would remain N11¹³

950-XXXX would remain 950-XXXX

202-555-1212 becomes 202-0555-1212 after the first transition phase,
then 2021-0555-1212 after the second transition phase

8.4.2 Transition to Expanded NANP Using Method 3

The fourth digit in the existing ten-digit NANP cannot be a 0 or 1. Using the 0 digit in the D digit position will provide the necessary indication for all switching equipment and operational support systems to ensure identification of an expanded eleven-digit NANP number during the first transition phase.

Phase one transitioning is enabled by adding the digit 0 as the new first digit of the CO code field. Limiting the value of the new digit to 0 is necessary to provide uniqueness to the new number and to allow for the second phase transition. Subsequent to transitioning into phase one, the new digit can take on all values other than the value 1. Once the switching system has determined that the end user dialed an existing ten-digit number, the switch can be instructed to insert a 0 in the fourth digit position (i.e., first position of the CO code field) and forward this number on to subsequent switching systems.

Phase two transitioning is enabled by adding the digit 1 as fourth digit of the NPA code. Since the restriction barring the use of the digit 1 in the first digit of the CO code field remains, using the value 1 for the new fourth digit of the expanded NPA field will enable switching systems to determine whether an eleven-digit or twelve-digit number has been dialed.

This Method 3 transitioning does not support the adoption of a unique digit for Canada's exclusive and permanent use.

¹³ However, should the subscriber dial N110 or N111, the results will be the same as if N11 was dialed.

Signaling and billing systems can be arranged to transition to the eleven-digit and then a twelve-digit NANP number long before customers need to dial the eleven-digit number and then the twelve-digit number.

During the permissive dialing periods, network switches will be able to determine whether the caller was dialing an expanded format or non-expanded number by checking the value of the D and E digits.

It is recommended that one year permissive dialing periods be used to effect a transition. At the end of the transition phases, digits other than 0 and 1 can be assigned in the expanded digit fields.

It is also recommended that there be an interval of not less than several decades between the end of the step one transition period and the beginning of the step-two transition period.

8.5 Comparison of Transition Methods

The INC supports an eventual expansion of the NANP by two digits, going from ten to twelve digits. In converging on that ultimate goal, INC recognizes that expansion by a single digit will provide relief from exhaust for a considerable, though indeterminate, length of time. Policy-makers may opt to implement only a first phase initially and postpone implementation of a second phase until necessity peeks over the horizon. Clearly, expanding either the NPA field or the CO code field will generate sufficient resources to accommodate the numbering needs in the near term. However, the telecommunications industry's orderly evolution requires long term planning, which the INC's two-digit plan provides by pointing the way to a further expansion. If decision-makers elect a phased approach, the industry will be able to plan for the long term whether policy-makers choose to start with the NPA or the CO code fields. If policy-makers choose to implement both changes at once, they should gain sufficient resources to meet the industry's and the public's needs for the imaginable future.

Policy-makers must evaluate and resolve the issue regarding the complexity to the public at large of a one-time change involving two digits versus two separate changes, each involving a single digit. If it is determined that two separate changes are easier for the public to deal with, the next question is whether the perceived human factor advantage in a phased transition is sufficient to overcome the additional cost for a two-phase implementation.

The various methods of transitioning to the expanded NANP must be considered in many contexts. However, there are no significant technical obstacles identified with any of the methods. Two important considerations are costs and human factors, neither of which INC has examined in a definitive manner since both lie outside its mandate.

From a relative cost perspective, INC believes there is no significant cost difference between Methods 2 and 3. Since both are implemented in two phases, the costs to

inform and prepare the public, as well as to design, engineer, and deploy telecom networks, equipment, and systems must be borne twice. However, Method 1 enjoys the benefit of incurring such expenses only once and therefore is the clear winner with respect to cost minimization. Moreover, with Method 1 the full benefit of the expanded NANP will be made available to the public and the telecommunications industry immediately after the single-phase transition.

Considering implementing only the first phase of Method 2 or 3 in the near term presents a different set of trade-offs. The first phase of Method 2 will not directly affect the need for NPA relief; it will simply provide more NPAs to relieve those nearing exhaust. Expanding the CO code field by adding a digit in front of it will achieve an eleven-digit NANP, but will require mandatory and universal eleven-digit dialing. However, the latter approach will provide sufficient CO codes (7000 per NPA instead of today's 800) to reduce and, in most cases, possibly eliminate the need for NPA relief.

While a major benefit of Method 3 in comparison to Method 2 is the elimination of future NPA splits/overlays in the first phase of NANP expansion, its implementation will only effectively work if a significant number of unassigned NPAs are still available in the industry pool. In order to ensure that adequate NPAs will be available for future industry needs, Method 3 will have to be started in a timeframe that is much earlier than that needed for Methods 1 or 2. The earlier starting timeframe required for Method 3 runs counter to one of the primary goals of the industry: to delay any NANP Expansion plan as long as possible in order to avoid the cost and service impacts associated with this major undertaking. The cost impacts associated with the necessary network changes and the impacts on the entire NANP end user community associated with this Method 3 will be no less than the impacts associated with any other NANP expansion plan. To proceed with Method 3, policy-makers, the industry, and the public must prepare for expansion well in advance of the point at which all available NPAs had been assigned.

Method 1 combines the benefits of adding resources to each NPA, deferring the need for NPA relief, adding additional NPAs, as well as allowing NANP expansion to be deferred as long as possible. Method 1 also minimizes the number of expansion conversions the public and industry would have to endure.

8.5.1 Comparison Summary

The following table provides a comparison of the three NANP Expansion methods.

**Table 2: Comparison Table of Transition Methods
NPA(X) – (X)NXX – XXXX**

Features	Method 1 (Both NPA & CO digits at once)	Method 2 (NPA digit first then CO digit)	Method 3 (CO digit first then NPA digit)
Opening of D digit prior to NANP expansion	No	No	No
Ten-Digit Dialing prior to NANP expansion	Required	Required	Required
80 N9X NPAs ¹⁴	Can be assigned	Can be assigned	Can be assigned
Implementation	One phase	Two phases	Two phases
When to Implement	Near NANP exhaust (i.e., no NPAs left)	Near NANP exhaust (i.e., no NPAs left)	Earlier than NANP exhaust, to ensure enough NPAs left to delay transition to Phase 2
Human Factor Considerations	One implementation phase by adding 2 digits at same time	Two implementation phases adding one digit at a time	Two implementation phases adding one digit at a time
Canadian Identity Digit Requirement	Can support	Can support	Cannot support
Dialing Plan	12 digits at start	11 digits during Phase 1 & 12 digits during Phase 2	11 digits during Phase 1 & 12 digits during Phase 2
Initial Increased Capacity	Adds digits to NPA & CO fields at start	Phase 1 only adds digit to NPA field	Phase 1 only adds digit to CO field
Reduces Future NPA Relief	Yes	No	Yes
Relative Cost	Lower	Greater	Greater
Time to Complete (See reference in Section 5.3)	Completed in one phase	Two phases separated by several decades	Two phases separated by several decades

¹⁴ These NPAs are currently reserved for use in transition to an expanded NANP through an option other than that recommended in this Report. Releasing these codes will defer NANP exhaust beyond the current NANPA projections.

9.0 General Drivers and Timing, for NANP Expansion

9.1 Drivers for NANP Expansion

The following lists potential circumstances, concepts and possible reasons for expanding the capacity (capability) of the existing NANP. Some may be more probable than others.

- 1) Overall exhaust of NPA codes
- 2) Focused exhaust of NANP components
 - specific types of NPA codes [e.g., Easily Recognizable Codes (ERC)]
 - Central Office codes (e.g., local competition, etc.)
 - subscriber line numbers (e.g., SAC 800)
- 3) New functionality requirement
 - embedded carrier identification
- 4) Change in international standard(s)
 - mandated change to NANP format
- 5) Change in NANP participation
 - adding new country(s)
- 6) Change in NANP country relationship(s)
 - mandated need to embed country identification
- 7) Need to overcome an existing NANP deficiency
 - accelerated exhaust of CO codes
 - accelerated exhaust of line numbers
 - break away from 'fixed' format
 - increase efficiency (structure/administration)

9.2 Timing for NANP Expansion

9.2.1 Timing

The INC believes that the industry will require up to ten years to transition to the expanded NANP. A date certain for expansion needs to be set by regulatory directive with the necessary lead-time to accommodate industry expansion activity and public notification and training prior to the actual expansion date. The exact determination of the date of NANP exhaust and the related date of the implementation of the NANP Expansion Plan are not within the purview of the Industry Numbering Committee, but rather the NANPA and the appropriate regulatory authorities. In order to realize a ten year implementation plan, it will be necessary to evolve North American telecommunications network(s) to eliminate any encumbrances to implementing the NANP expansion plan.

9.2.2 Timeline

Table 3 provides a timeline for NANP expansion. This timeline, which will be applicable to phase one of any of the three transition methods described in this report, is based on a starting point identified as Year X. Section 5.2, which describes how the trigger is determined for each expansion method, will set the Year

X starting point. If a multi-phase transition is chosen, then the second phase would start over at step one.

The overall timeframe for NANP expansion starting from starting from Year X will be ten years with various milestones defined throughout this ten-year period.

Table 3: NANP Expansion Plan Timeline

<u>STEP</u>	<u>ACTIVITY/MILESTONE</u>	<u>DATE/TIMING</u>
1	NANP expansion trigger reached	Year X
2	Recommend NANP cut-over relief date	Year X
3	Regulatory approval of NANP cut-over date	Year X
4	Notify industry, media, and public	Year X
5	Commence expansion implementation - Commence clearing of D-digit - Commence implementation of ten-digit dialing	Year X
6	D-digit cleared	Year X + 5
7	Ten-digit dialing in place	Year X + 5
8	Commence expansion deployment in network	Year X + 6
9	NANP cut-over - Commence permissive dialing	Year X + 9
10	Commence assigning expanded format numbers	Year X + 9
11	Terminate permissive dialing	Year X + 10
12	Additional NANP resources available for assignment	Year X + 10

10.0 Plan Update Procedures/Responsibilities

The INC recognizes that the final decision regarding expanding the NANP is likely to be dominated by economic and ergonomic considerations.

The INC also recognizes that there is no current means of making an expansion transparent to all telecommunications users who communicate within the NANP and worldwide. Implementing NANP expansion will therefore prove to be a major public relations challenge, and this task doubtlessly will constitute a major portion of the total cost of expansion. Any further work of determining the exact cost and human factors impacts must be addressed by parties other than the INC. Policy-makers in NANP nations will also have important roles to play in the orderly implementation of expansion.

The INC will periodically review NANP exhaust projections and may supplement this industry effort as needed.

11.0 Other Fora/Workshops Impacted

Once the current nineteen NANP regulatory authorities have agreed upon the INC format for expansion of the NANP, a number of other standards and procedures must be developed. INC recognizes that other industry fora would need to initiate actions in their respective areas of expertise. Some of the groups affected are noted below, but do not represent an all-inclusive list:

Table 4: Standards Development & Implementation

STANDARDS TYPE	GROUP AFFECTED	WORK DESCRIPTION	COMMENTS
Customer and Access Billing records	ATIS/OBF	Development of new or modification of old billing structures gathered by switching systems	This work includes the development of specifications needed by switch manufacturers to change the existing AMA recordings.
Access Ordering	ATIS/OBF	Modifications needed in Access ordering forms and procedures.	
Technical Specification for NANP Expansion	ATIS/T1	Development of technical documents for equipment suppliers to modify existing switching conventions.	Includes rate center definitions, translation requirements and signaling requirements.
NANP Expansion Test Plans	ATIS/NIIF	Development of an industry test plan to verify that network capabilities are in place to expand the NANP	Includes the expansion of published test plan numbers and uses.
NANP Expansion Testing	ATIS/IITC/NTC	Arrangements for industry laboratory interoperability testing prior to testing in the actual working NANP.	
The Telcordia™ Business Integrated Routing and Rating Data Base System (BIRRDS)	ATIS/NIIF/ NRRIC	Determination of the input and output requirements for industry OSSs to define and publish the necessary information to properly route calls using the expanded NANP.	Call Completion
Modifications to input and output of the BIRRDS	Telcordia™ Routing Administration/ CIGRR	Expansion of existing OSS.	Based upon NRRIC requirements.
Modify, Develop and publish numbering guidelines	ATIS/INC	Assignment and reporting guidelines for expanded numbering plan	COCAG, TBPAG, NRUF, etc.
Country Code "1" Numbering Plan Expansion Notification	ITU-T Technical Standardization Bureau – (TSB)	World Notification of Numbering Plan Expansion	Based on information from the NANPA
Expanded format Toll Free Number Guidelines	ATIS/OBF SNAC	Expansion of SMS-800 System	

Annex A
NANP Standard Prefixes and Access Codes for Originating Calls

- **0 = Telephone Company Operator**
- **0+ 10 digits = Person Paid Collect Special (PPCS) Call**
- **00 = Long Distance Carrier Operator**
- **01 = International PPCS Call**
- **011 = International Station to Station Sent Paid (SSSP) Call**
- **1+ = Toll Access for SSSP Calls**
- ***XX (*XXX) = Vertical Service Code Access**
- **11XX (11XXX) = Vertical Service Code Alternate (Permissive) Access**
- **101XXXX = Carrier Access Code (CAC), Feature Group “D”**
- **950-XXXX = Carrier Access Code (CAC), Feature Group “B”**
- **# = End of dialing signal**

Annex B

Phase I & Phase II Eliminated Options/Rationale

B.1.0 Introduction

The process followed by the Industry Numbering Committee (INC) to determine the NANP Expansion Reference Document involved development of an initial list of all potential expansion options. This was followed by a first phase elimination process, which was based on the option's failure to meet one or more of the established criteria.

The listing and descriptions of the expansion options are contained in Section 6 of this report. The Assumptions & Constraints, Functionalities and Assessment Criteria used to measure each option are described in Section 2.0, 3.0 and 4.0 respectively.

This Annex is intended to provide a record of the rationale used by the INC to eliminate the options during the initial (Phase I) review and during the detailed (Phase II) review.

Section B.2 contains rationale for options eliminated during the Phase I review and Section B.3 contains the rationale for elimination of options during the Phase II review.

B.2.0 Eliminated Options – Phase I

B.2.1 Expansion Alternative Option 7 – Country Code Segregation

B.2.1.1 Description

The Option called for the segregation of the NANP countries through the assignment of distinct country codes to each country (or group of countries in the case of the Caribbean portion of the NANP).

B.2.1.2 Rationale

It was determined that this Option actually represents the dissolution of the NANP, rather than an expansion of it. Further, it was thought that this Option failed to meet the terms of item g in Assumptions and Constraints (i.e., The expanded NANP resources will continue to be assigned to and used exclusively by service providers and users who reside in the countries that form the NANP community.)

B.2.2 Expansion Alternative Option 6C – Network/Service Provider Assigned NDC

B.2.2.1 Description

This Option would assign NDCs immediately after the country code but preceding the remaining digits of the NANP (NPA NXX-XXXX). This Option requires that any network/service provider offering telecommunication services within the NANP would be required to obtain one of these NDC codes. This Option further requires the dialing of a four-digit code in order for calls to be routed to the network identified by such a code. The format would be as follows:

1 + NXXX + NPA NXX XXXX (where NXXX is the NDC)

B.2.2.2 Rationale

This Option allows every network/service provider assigned an NDC to have the utilization of the full range of the NANP numbering resources. This is an inefficient and ineffective use of the numbering resource since it is highly unlikely that these numbers will ever be fully utilized. This Option would also not support number portability services e.g., 800. Requiring the selection of a network/provider on each call by means of dialed digits undermines the ability of the network to perform database queries and route to a different provider. In addition, the fifteen-digit number length of this Option is contrary to INC agreements not to add more than two digits under any expansion plan to be consistent with Recommendation E.164. In other words, this Option failed to meet the terms of item e in Assumptions and Constraints, i.e., the expanded NANP will remain consistent with International Telecommunications Union (ITU) Recommendation E.164 (Public Telecommunications Numbering Plan).

B.2.3 Expansion Option E3 – NIC Field Between NPA and NXX Codes

B.2.3.1 Description

This Option would assign at least a two-digit Network Identification Code (NIC) immediately after the NPA but preceding the NXX code. The function of this two-digit NIC would identify a network/service provider within a given NPA. This Option requires that any network/service provider who wants to offer service within an NPA would be required to obtain an NIC. This Option requires the dialing of an additional two-digit code in order for calls to be routed to the network/service provider identified by such a code. The format would be as follows:

NPA (XX) NXX XXXX

where:

XX = two-digit NIC

B.2.3.2 Rationale

The major concern of this Option is the size of the NIC field. Limiting this field to two digits restricts the number of network/service providers within an NPA to 100.

Competition and the industry experience to expand Carrier Identification Codes (CICs) to a four-digit field provide proof that a two-digit field is too small and is a limiting factor. Therefore, the NIC field will ultimately have to expand beyond two digits, which is in violation of the agreement to restrict the total expansion of the NANP to not more than two digits. In other words, this Option would eventually fail to meet the terms of item e in Assumptions and Constraints, i.e., the expanded NANP will remain consistent with International Telecommunications Union (ITU) Recommendation E.164 (Public Telecommunications Numbering Plan).

This Option allows every network/service provider assigned an NIC to have the utilization of the full range of the remaining seven digits (NXX XXXX). This would provide up to one hundred carriers exclusive access to the approximately 792 Central Office codes in an NPA. This would dedicate enormous numbering resources to a fixed number of service providers. In addition, the concept of embedding network identification in the number is in conflict with the need to provide service provider number portability. Thus, this Option fails to meet Assumption and Constraint item h, i.e., the expanded NANP must provide for adequate numbering resources for a competitive environment within any of the countries served by the NANP. The plan should not disadvantage one industry segment or NANP country over another.

B.2.4 Expansion Alternative Option 1

B.2.4.1 Description

Release of the D digit to allow the use of digits “1” through “9”.

B.2.4.2 Rationale

A high-level analysis using Assessment Criteria 4.3 Life Expectancy of the Expanded NANP shows that this expansion Option does not provide adequate additional capacity to warrant serious consideration relative to other options. The implementation of this alternative would only expand the capacity of the NANP by 100 Central Office codes in each NPA. Releasing the D digit (“1” through “9”) would demand major changes to switching and support systems, modifications in routing logic and would require the elimination of seven-digit dialing. Additionally, conflicts would be created between existing internal network and billing uses of codes in this format (1XX). Although other options also release the D digit, they do so in the context of much larger increases in capacity and as part of larger changes to the NANP format. This Option also does not add NPA capacity which is a requirement of Assumption and Constraint item i, i.e., The expanded NANP must contain a functional component to increase the quantity of Numbering Plan Areas (NPAs) in order to ensure the availability of additional NPAs when the current supply is exhausted.

B.2.5 Expansion Alternative Options 3, 4, 5a, 5b, 5c, 5d

B.2.5.1 Description

Each of these expansion options include releasing the A digit to take on additional values (“1” through “9”/“0” through “9”) in order to increase the existing capacity of the NANP without expanding the ten-digit format of the plan.

B.2.5.2 Rationale

A high-level analysis of these options using Assessment Criteria 4.2 Impact on Call Processing and Network Operations shows that the current A digit restriction (“2” through “9”) allows critical network and operational functionality. For example, “0” and “1” are used in combination as prefixes to identify non-local calls, direct international dialing, operator assistance, directory assistance, carrier access code dialing, etc. This allows for immediate, simple and unambiguous distinction by the network components to identify the type of the call. In addition, it allows for basic digit analysis and call routing. The release of the A digit would therefore require that all switching and support systems be modified, and that related routing logic and digit analysis processes be changed in order to appropriately identify the type of call.

The release of the A digit would necessitate the development of a new dialing plan or the introduction of a timing method since the network could no longer distinguish between a prefix and the beginning of a number assigned to a subscriber. Almost every known numbering plan worldwide sets aside at least one digit for prefix identification in order to allow the network to distinguish a prefix from the beginning of a subscriber number in their national numbering plan. These changes would negatively impact both subscribers and network providers both from an inconvenience and cost perspective. It is anticipated that the significant impacts of making this change would not be commensurate with the additional numbering resources that would be created.

Another factor that needs to be considered is that networks throughout the areas served by the NANP utilize the 0XX and 1XX formatted NPA codes for internal routing and billing purposes. If the A digit is released, every service provider/network operator would need to modify their internal routing and billing to eliminate the use of 0XX and 1XX in their network.

In addition to the reasons above, an analysis using Assessment Criteria 4.3 Life Expectancy of the Expanded NANP shows that these options do not provide sufficient gains in numbering capacity to warrant further consideration. The gain in Options 3 and 4, in terms of additional resources relative to other options, does not provide the appropriate amount of additional numbering capacity. Options 3 and 4 do not meet Assumption and Constraint item j, i.e., the expanded NANP must mitigate the need for future NPA relief.

B.2.6 Expansion Option E-2

B.2.6.1 Description

This Option expands the NPA code to five digits, NXX(X)(X), increasing the number of NPAs by 79,200 NPA codes.

B.2.6.2 Rationale

This Option utilizes the two available expansion digits in the NPA field and thus precludes adding any capacity to NXXs without violation of Assumption and Constraint item e [the expanded NANP will remain consistent with International Telecommunications Union (ITU) Recommendation E.164]. Therefore, it does not mitigate the need for NPA relief, which is Assumption, and Constraint item j.

A high-level assessment using Assessment Criteria 4.2 Impact on Call Processing and Network Operations shows that this expansion Option involves a fundamental change affecting all networks with significant impacts to current digit analysis processes and operational support systems.

B.2.7 Expansion Option E-5

B.2.7.1 Description

This Option would expand the Central Office code to five digits, NPA – NXXXXX. In doing so, it expands the NANP to 79,200 CO codes per NPA, a hundred-fold increase from the current 792 CO codes in an NPA.

B.2.7.2 Rationale

This plan expands the capacity of the NANP by 79,200 CO codes per NPA. This Option utilizes the two available expansion digits for CO code expansion and thus precludes adding any capacity to NPAs without violation of Assumption and Constraint item e, i.e., the expanded NANP will remain consistent with International Telecommunications Union (ITU) Recommendation E.164, and therefore does not provide any additional NPA capacity, Assumption and Constraint item I.

A high-level assessment using Assessment Criteria 4.2 Impact on Call Processing and Network Operations shows that this expansion Option affects all networks and impacts current digit analysis processes and operational support systems. Additionally, transitioning to this Option will be very difficult because adding two digits to the end of the current CO code field does not provide the network any triggers to determine whether the caller is dialing a ten-digit or twelve-digit number.

B.2.8 Expansion Option E-7

B.2.8.1 Description

This Option increases the length of the subscriber line number to six digits, NPA NXX - XXXX(X)(X), expanding the capacity of the NANP by one million line numbers per CO code per NPA.

B.2.8.2 Rationale

This Option utilizes the two available expansion digits to increase capacity in a less appropriate segment of the NANP, the line number. The more relevant segments are the CO/NXX codes, Assumption and Constraint item j, and the NPA, Assumption and Constraint item I, which are the levels at which resources are most rapidly being exhausted.

A high-level assessment using Assessment Criteria 4.2 Impact on Call Processing and Network Operations shows that this expansion Option affects all network and impacts current digit analysis processes and operational support sitemaps. Preliminary feedback from equipment vendors indicates that while all changes to the NANP carry significant cost impacts, changes to the line number would involve the greatest costs.

B.2.9 Expansion Option 6a

B.2.9.1 Description

This Option assigns a single-digit NDC in front of an existing NPA, thereby creating an eleven-digit NANP number. NDCs would be assigned to existing countries or geographic areas.

B.2.9.2 Rationale

It was determined that this NDC option was technically equivalent to expansion alternative 6b and therefore would not be independently evaluated.

B.3.0 Eliminated Options – Phase II

This section of Annex B provides the details of the rationale for the elimination of NANP Expansion Options during Phase II of the selection process. The numbering of the Options in this section does not necessarily relate to the numbering of the Options in the Phase I analysis. The remaining Options after the Phase I analysis were reorganized and re-numbered for the Phase II analysis.

B.3.1 Option 1-C – Four-Digit NPA With Five-Digit Line Numbers

It was agreed to eliminate Option 1-C at INC 39. The following provides the detailed rationale to support this decision.

B.3.1.1 Description – Format/Layout

Option 1-C adds a fourth digit to the area code field, maintains a three-digit Central Office code field with a released D digit, and adds a fifth digit to the line number field. The format for this option is:

NXX(X) + XXX + XXXX(X)

where N represents digits “2” through “9”, X represents digits “0” through “9”, and:

NXX(X) = a four-digit NPA with (X) the additional digit

XXX = a three-digit Central Office code with a released D digit

XXXX(X) = a five-digit line number with (X) the additional digit

B.3.1.2 Factors in Eliminating Option 1-C

The following factors were taken into consideration in the INC's decision to eliminate Option 1-C.

B.3.1.2.1 Least efficient utilization, maximizes stranded numbers

Assessment Criteria 4.4 Numbering Resource Utilization/Efficiency: Five-digit line numbers exacerbate the existing problem of stranding numbers behind Central Office (CO) codes in geographic areas or Service Access Codes where actual assignments of line numbers are inherently low (e.g., in rural areas). Specifically in an exchange in which only 3000 numbers will ever be assigned with four-digit line numbers, 7000 numbers are stranded, whereas with five-digit line numbers 97,000 numbers would be stranded.

Therefore, in relation to the other NANP expansion options under consideration this Option maximizes the quantity of stranded numbers and therefore is the least efficient in terms of number utilization and percent fill rates which are critical considerations in evaluating expansion plans.

B.3.1.2.2 Biggest change from existing format, maximum impact on individual subscribers

Assessment Criteria 4.1 Human Factors: This Option represents the largest change from the perspective of individual customers. This concern has two aspects.

First, the line number is the most personal component of the NANP and is often used in the construction of alphabetical representation for commercial / vanity purposes.

Second, with the change to four-digit NPAs with five-digit line numbers, all components of an individual's NANP telephone numbers will change under this option [i.e., NXX NXX XXXX becomes NXX(X) (X)XX XXXX(X)].

B.3.1.2.3 Greatest impact on end office switches and CPE

Assessment Criteria 4.2 Impact on Call Processing and Network Operations: Information received from vendors indicates that any change to the line number component of the NANP represents the greatest impact in terms of costs and development in end office switches and CPE.

B.3.1.2.4 Adds capacity where it may not be needed

Assessment Criteria 4.4 Number Resource Utilization/Efficiency: Adding capacity to the line number portion of the NANP number does not add capacity to the portion of the number where capacity is needed (i.e., the quantity of CO codes are not impacted). This will result in a perpetuation of the same code relief problems that we are faced with today. Therefore this Option is not beneficial to the industry and it does not justify the addition of an extra digit to this field of the numbering plan.

B.3.1.2.5 Least capable of supporting current and future routing/rating requirements

Assessment Criteria 4.5 Accommodating Future Network Requirements: While it is impossible to exactly predict future requirements, recent "new" requirements provide an indication that in all cases these were accommodated through allocation of either NPA or CO code resources (e.g., SAC 500 for PCS, CO codes to designate Public Data Services, etc.). In no case were specific line number resources used to support new services. Therefore, it must be concluded that additional line number capacity does not cater to the support of new requirements.

B.3.2 Option 2-C – Four-Digit NPA With a New A Digit and Five-Digit Line Number

It was agreed to eliminate Option 2-C at INC 39 (Edmonton, September 1998). The following provides the detailed rationale to support this decision.

B.3.2.1 Description – Format/Layout

Option 2-C involves the addition of a single digit to the NPA field in the NANP number. In addition, the existing ten-digit NANP number format is expanded to include a five-digit line number. It is assumed that the new digit is added at the end of the existing four-digit line number.

The new number format is as follows:

(N) NXX + XXX+ XXXX(X)

where:

N = 2 through 9

(N)NXX = Four-digit NPA field [(N)NXX or (N)XXX]

XXX = Three-digit field (Central Office Code)

XXXX(X) = Five-digit field, where (X) is the additional digit

B.3.2.2 Factors in Eliminating Option 2-C

The following factors were taken into consideration in the INC's decision to eliminate Option 2-C.

B.3.2.2.1 Least efficient utilization, maximizes stranded numbers

Assessment Criteria 4.4 Numbering Resource Utilization/Efficiency: Five-digit line numbers exacerbate the existing problem of stranding numbers behind Central Office (CO) codes in geographic areas or Service Access codes where actual assignments of line numbers are inherently low (e.g., in rural areas). Specifically in an exchange in which only 3,000 numbers will ever be assigned with four-digit line numbers, 7,000 numbers are stranded, whereas with five-digit line numbers 97,000 numbers would be stranded.

Therefore, in relation to the other NANP expansion options under consideration this Option maximizes the quantity of stranded numbers and therefore is the least efficient in terms of number utilization and percent fill rates which are critical considerations in evaluating expansion plans.

B.3.2.2.2 Biggest change from existing format, maximum impact on individual subscribers

Assessment Criteria 4.1 Human Factors: This Option represents the largest change from the perspective of individual customers. This concern has two aspects.

First, the line number is the most personal component of the NANP and is often used in the construction of alphabetical representation for commercial/vanity purposes.

Second, with the change to four-digit NPAs with five-digit line numbers, all components of an individual's NANP telephone numbers will change under this option [i.e., NXX NXX XXXX becomes (N)XXX (X)XX XXXX(X)].

B.3.2.2.3 Greatest impact on end office switches and CPE

Assessment Criteria 4.2 Impact on Call Processing and Network Operations: Information received from vendors indicates that any change to the line number component of the NANP represents the greatest impact in terms of costs and development in end office switches and CPE.

B.3.2.2.4 Adds capacity where it may not be needed

Assessment Criteria 4.4 Number Resource Utilization/Efficiency: Adding capacity to the line number portion of the NANP number does not add capacity to the portion of the number where capacity is needed (i.e., the quantity of CO codes are not impacted). This will result in a perpetuation of the same code relief problems that we are faced with today. Therefore this Option is not beneficial to the industry and it does not justify the addition of an extra digit to this field of the numbering plan.

B.3.2.2.5 Least capable of supporting current and future routing / rating requirements

Assessment Criteria 4.5 Accommodating Future Network Requirements: While it is impossible to exactly predict future requirements, recent "new" requirements provide an indication that in all cases these were accommodated through allocation of either NPA or CO code resources (e.g., SAC 500 for PCS, CO codes to designate Public Data Services, etc.). In no case were specific line number resources used to support new services. Therefore, it must be concluded that additional line number capacity does not cater to the support of new requirements.

B.3.3 Option 3-C – NDC + NPA With Five-Digit Line Numbers

It was agreed to eliminate Option 3-C at INC 39. The following provides the detailed rationale to support this decision.

B.3.3.1 Description – Format/Layout

Option 3-C involves the addition of a single-digit National Destination Code (NDC) as a new field in the NANP number. In addition, the existing ten-digit NANP number capacity is expanded to include five-digit line numbers. It is assumed that the new digit is added at the end of the existing four-digit line number.

The new number format is as follows:

NDC + NPA + XXX+ XXXX(X)

where:

N = "2" through "9"

NDC = New single-digit field

NPA = Three-digit field (NXX or XXX)

XXX = Three-digit field (Central Office Code)

XXXX(X) = Five-digit field, where (X) is the additional digit

B.3.3.2 Factors in Eliminating Option 3-C

The following factors were taken into consideration in the INC's decision to eliminate Option 3-C.

B.3.3.2.1 Least efficient utilization, maximizes stranded numbers

Assessment Criteria 4.4 Numbering Resource Utilization/Efficiency: Five-digit line numbers exacerbate the existing problem of stranding numbers behind Central Office (CO) codes in geographic areas or Service Access codes where actual

assignments of line numbers are inherently low (e.g., in rural areas). Specifically in an exchange in which only 3000 numbers will ever be assigned with four-digit line numbers, 7000 numbers are stranded, whereas with five-digit line numbers 97,000 numbers would be stranded.

Therefore, in relation to the other NANP expansion options under consideration this Option maximizes the quantity of stranded numbers and therefore is the least efficient in terms of number utilization and percent fill rates which are critical considerations in evaluating expansion plans.

B.3.3.2.2 Biggest change from existing format, maximum impact on individual subscribers

Assessment Criteria 4.1 Human Factors: This Option represents the largest change from the perspective of individual customers. This concern has two aspects.

First, the line number is the most personal component of the NANP and is often used in the construction of alphabetical representation for commercial / vanity purposes.

Second, the introduction of the NDC field, while not changing the NPA itself, changes the traditional meaning of the NPA (i.e., NPAs will require the NDC component to designate geographic NANP areas). When this is combined with five-digit line numbers and the unrestricted XXX CO Code format, all components of an individual's NANP telephone number will change under this option [i.e., NXX NXX XXXX becomes (N) NXX (X)XX XXXX(X)].

B.3.3.2.3 Greatest impact on end office switches and CPE

Assessment Criteria 4.2 Impact on Call Processing and Network Operations: Information received from vendors indicates that any change to the line number component of the NANP represents the greatest impact in terms of costs and development in end office switches and CPE.

B.3.3.2.4 Adds capacity where it may not be needed

Assessment Criteria 4.4 Numbering Resource Utilization/Efficiency: Adding capacity to the line number portion of the NANP number does not add capacity to the portion of the number where capacity is needed (i.e., the quantity of CO codes are not impacted). This will result in a perpetuation of the same code relief problems that we are faced with today. Therefore this Option is not beneficial to the industry and it does not justify the addition of an extra digit to this field of the numbering plan.

B.3.3.2.5 Least capable of supporting current and future routing / rating requirements

Assessment Criteria 4.5 Accommodating Future Network Requirements: While it is impossible to exactly predict future requirements, recent "new" requirements provide

an indication that in all cases these were accommodated through allocation of either NPA or CO code resources (e.g., SAC 500 for PCS, CO codes to designate Public Data Services, etc.). In no case were specific line number resources used to support new services. Therefore, it must be concluded that additional line number capacity does not cater to the support of new requirements.

B.3.4 Option 2-B – Four-Digit NPA With a New A Digit, D Digit Release, and Four-Digit CO Codes

It was agreed to eliminate Option 2-B at INC 45. The following provides the detailed rationale to support this decision. A full description of this Option is contained in Section 7 of this report.

B.3.4.1 Description – Format/Layout

Option 2-B involves the addition of a single-digit (new A digit in the N format) to the NPA field in the NANP number, plus the addition of a new digit (in the X format) to the beginning of the CO code field.

The new number format is as follows:

(N) NXX + (X) XXX + XXXX

where:

(N) NXX = four-digit NPA field (N) NXX or (N) XXX, where (N) is the additional digit

(X) XXX = four-digit field (CO Code), where (X) is the additional digit
XXXX = four-digit line number field

B.3.4.2 Factors in Eliminating Option 2-B

The following factors were taken into consideration in the INC's decision to eliminate Option 2-B.

B.3.4.2.1 Transition Problems

Assessment Criteria 4.1 Human Factors Needs, Assessment Criteria 4.2 Impact on Call Processing and Network Operation, and Assessment Criteria 4.10

Evolution/Transition: The INC has determined to implement NANP expansion in a single phase, in this case (i.e., Option 2-B), this means that both the NPA field and the CO code must be expanded simultaneously with callers required to insert new digits at two different, separate places within the existing numbering format (as opposed, for example, to Option 1-B where the two digits would be inserted as a pair). It is felt that this double "hit" is too complex from a human factor perspective to be acceptable. Further from a network call processing perspective, this Option requires the introduction (or re-introduction) of a prefix to enable differentiation from old and new formatted calls for at least the permissive dialing period of the transition

plan. Even with the use of a prefix, there is no identified practicable means of differentiating between calls dialed in the old three-digit CO code format versus those dialed in the new four-digit CO code format.

B.3.5 Option 3-B – NDC + NPA With Four-Digit CO Codes

It was agreed to eliminate Option 3-B at INC 45. The following provides the detailed rationale to support this decision. A full description of this Option is contained in Section 7 of this report.

B.3.5.1 Description – Format/Layout

Option 3-B involves the addition of a single-digit National Destination Code (NDC) as a new field in the NANP number, plus the addition of a new digit (in the X format) to the beginning of the CO code field.

The new number format is as follows:

$$N + NXX + (X) XXX + XXXX$$

where:

N = "2" through "9"

N = new single-digit NDC field

NXX = three-digit NPA field in the NXX format

(X) XXX = four-digit field (CO code), where (X) is the additional digit

XXXX = four-digit line number field

B.3.5.2 Factors in Eliminating Option 3-B

The following factors were taken into consideration in the INC's decision to eliminate Option 3-B.

B.3.5.2.1 Transition Problems

Assessment Criteria 4.1 Human Factors Needs, Assessment Criteria 4.2 Impact on Call Processing and Network Operation, and Assessment Criteria 4.10

Evolution/Transition: The INC has determined to implement NANP expansion in a single phase, in this case (i.e., Option 3-B), this means that the NDC field must be created and the CO code field must be expanded simultaneously so users may be required to insert new digits at two different points within the existing number. It is felt that this double "hit" is too complex from a human factor perspective to be acceptable. Further from a network call processing perspective, there is no identified practicable means of differentiating between calls dialed in the old three-digit CO code format versus those dialed in the new four-digit CO code format.

B.3.6 Option 4-B – Four-Digit NPA With a New B Digit, D Digit Release and Four-Digit CO Codes

It was agreed to eliminate Option 4-B at INC 45. The following provides the detailed rationale to support this decision. A full description of this Option is contained in Section 7 of this report.

B.3.6.1 Description – Format/Layout

Option 4-B involves the addition of a single-digit (new B digit in the X format) to the NPA field, plus the addition of a new digit (in the X format) to the beginning of the CO code field.

The new number format is as follows:

N (X) XX + (X) XXX + XXXX

where:

N (X) XX = four-digit NPA field, with (X) as the additional digit
(X) XXX = four-digit CO code field, with (X) as the additional digit
XXXX = four-digit line number field

B.3.6.2 Factors in Eliminating Option 4-B

The following factors were taken into consideration in the INC's decision to eliminate Option 4-B.

B.3.6.2.1 NPA Exhaust Mitigation

The INC is committed to the mitigation of NPA exhaust through the creation of additional resources in the CO code/line number field(s), see Assumption and Constraint item j. All options under consideration, including Option 4-B, achieve this through the release of the D digit in the CO code field (200 new CO codes = 25% increase in line number capacity in every NPA code).

B.3.6.2.2 Transition Problems

Assessment Criteria 4.1 Human Factors Needs, Assessment Criteria 4.2 Impact on Call Processing and Network Operation, and Assessment Criteria 4.10 Evolution/Transition: The INC has determined to implement NANP expansion in a single phase, in this case (i.e., Option 4-B), this means that both the NPA field and the CO code must be expanded simultaneously. It is felt that this double "hit" is too complex from a human factor perspective to be acceptable. Further, from a network call processing perspective, there is no identified practicable means of differentiating between calls dialed in the old three-digit CO code format versus those dialed in the new four-digit CO code format.

B 3.7 Elimination of Options 2-A, 3-A, and 4-A

The following is the rationale used to eliminate Options 2-A, 3-A, and 4-A at INC 52. Each Option is described and the criteria and rationale for its elimination are presented. A full description of these Options is contained in Section 7 of this report.

B 3.7.1 Description of Option 2-A

Option 2-A involves the addition of a single-digit (new A digit in the N format) to the NPA field in the NANP number as follows:

(N)XXX + XXX + XXXX

where:

(N)XXX = A four-digit Numbering Plan Area Code (a four-digit field where N = 2 through 9 and X= 0 through 9) Note: The B digit is released to X values.

XXX = Central Office Code (a three-digit field in the format XXX where X= 0 through 9)

XXXX = Line number (a four-digit field in the format XXXX where X= 0 through 9)

B 3.7.1.2 Criteria and Rationale for Elimination Option 2-A

B 3.7.1.2.1 Assessment Criteria 4.1 Human Factors Needs

Confuses the relationship to the existing NPAs by adding a digit to the beginning of the existing NPA (i.e., 972 becomes 2972, and 800 becomes 2800).

Requires the use of a prefix, such as 1 or 11, in order to differentiate between the old and new formats during the permissive dialing period.

B 3.7.1.2.2 0 + Dialing

Assessment Criteria 4.1 Human Factors Needs and 4.2 Impact on Call Processing and Network Operations: For a credit card call during the permissive period:

One can dial either:

0 + (2) NPA - NXX – XXXX (Expanded format) or
0 + NPA – NXX – XXXX (Existing format)
(Receives a prompt) + credit card number

Option 2-A uses the reintroduction of the prefix 1 to enable the networks to determine whether the call has been dialed using the existing format or the expanded format. 0+ dialing will continue after the uniform dialing plan is implemented and will continue after expansion. Since for Option 2-A, there is no prefix 1 dialed for 0+ calling, there is no way for the network to tell during

permissive dialing whether the caller is dialing the expanded or existing format for 0+ calls without using a timer at the end of the dialing stream.

The selected NANP expansion plan during and after the transition period has to support 0 + dialing in the same way as is done in the existing NANP. Option 2-A does not provide networks this capability. The only way to tell is to wait to the end of the dialing stream and this could cause confusion between the last dialed digits and a response to a network prompt.

For consistency with the new expanded dialing plan (during transition), if the prefix 1 were retained for these credit card calls, a conflict with international operator assisted calls will result.

For a credit card call during permissive period:

One can dial either:

01+ **(2)** NPA - NXX – XXXX (Expanded format) or
0 + NPA – NXX – XXXX (Existing format)
(Receives a prompt) + credit card number

However:

01+237+local number would be dialed when attempting to place an operator assisted call to Cameroon causing a conflict with the expanded format.

Removal of the need to dial the prefix after the permissive dialing period is another change to the dialing plan and therefore will be confusing to the public.

B 3.7.2 Description of Option 3-A – National Destination Code (NDC)

This Option adds a new single-digit National Destination Code (NDC) field to the NANP number format between the Country Code and the current NANP ten-digit address. The new NANP number format would be as follows:

NDC + NPA + XXX+ XXXX

where:

NDC = National Destination Code (a new single-digit field in the format N, where N = 2 through 9)

NPA = Numbering Plan Area (a three-digit field in the format NXX, where N = 2 through 9 and X= 0 through 9)

XXX = Central Office code (a three-digit field in the format XXX, where X= 0 through 9)

XXXX = Line number (a four-digit field in the format XXXX, where X= 0 through 9)

B 3.7.2.2 Criteria and Rationale for Elimination of Option 3-A

B 3.7.2.2.1 Assessment Criteria 4.1 Human Factors Needs

Requires the use of a prefix, such as 1 or 11, in order to implement inter-NDC dialing while permitting ten-digit intra-NDC dialing. The reuse of prefix 1 would require the prior implementation of the INC Uniform Dialing Plan (i.e., ten-digit local and toll dialing and elimination of the prefix 1) throughout the NANP area.

Option 3-A also reintroduces the prefix 1. It is used to distinguish between intra-NDC and inter-NDC calling. For a credit card call during the permissive period, it is not clear from the Option 3-A description whether the NDC in Option 3-A would be dialed or not for intra-NDC calls.

Either for an intra-NDC call or for an inter-NDC call, one could dial:

0 + **(NDC)** + NPA – NXX – XXXX (Expanded format) or
0 + NPA – NXX – XXXX (Existing format)
(Receives a prompt) + credit card number.

The selected NANP expansion plan during and after the transition period has to support 0 + dialing in the same way the existing NANP. Option 3A does not provide networks this capability. The only way to tell is to wait to the end of the dialing stream and this could cause confusion between the last dialed digits and a response to a network prompt.

For consistency with the new expanded dialing plan (during transition), if the prefix 1 were retained for these credit card calls, a conflict with international operator assisted calls.

For a credit card call during permissive period:

One can dial either:

01+ **(2)** NPA - NXX – XXXX (Expanded format) or
0 + NPA – NXX – XXXX (Existing format)
(Receives a prompt) + credit card number

However:

01+237+local number would be dialed when attempting to place an operator assisted call to Cameroon causing a conflict with the expanded format.

Prohibits consistent dialing within the USA.

Complicates the transition plan and customer education process because there is no uniform rule to derive post-expansion numbers from pre-expansion numbers (i.e., different areas would be located in different NDCs). Callers must be educated during the transition period regarding how existing numbers would be modified via the addition of NDCs for different geographic areas.

Using both ten-digit dialing for intra-NDC calls and prefix dialing for inter-NDC calls would increase the potential for and quantity of misdialed calls and calls completed to wrong numbers due to ambiguities between NDCs and the first digit of geographic area codes.

B 3.7.3 Description of Option 4-A – Four-Digit NPA With New “B” Digit

This Option adds an additional digit in the second position of the area code field. Option 4-A also releases the first digit of the Central Office code in the current NANP structure to allow the use of the digits 0 or 1 in addition to the currently available digits 2 through 9. An eleven-digit number is created with this option. The number format for this option is as follows:

$$N(X)XX + XXX + XXXX$$

where N represents digits 2 through 9, X represents digits 0 through 9, and:

N(X)XX = a four-digit NPA with (X) the additional digit

XXX = a three-digit Central Office code with a released D digit

XXXX = a four-digit line number

B 3.7.3.1 Dependencies and Prerequisites

This Option can be implemented if the D digit is released prior to NANP expansion and does not require the elimination of the prefix 1.

B 3.7.3.2 Criteria and Rationale Elimination for Option 4-A

B 3.7.3.2.1 Assessment Criteria 4.1 Human Factors Needs

Transition is accomplished by making the new digit a 9. Expanding the NANP by inserting the digit 9 between the first and second digits of all existing NPAs may be difficult to explain, may be hard to understand by the general public, and is user-unfriendly.

B 3.7.3.2.2 Immediate Benefit

Assessment Criteria 4.7 Consistency with Public Policy: This option does not allow release of the 80 N9X formatted NPAs for assignment prior to expansion, as they are required for this expansion. By releasing these codes the existing NANP will immediately gain needed capacity and delay the need for expansion. Therefore,

greater benefit can be realized to the public by using these codes rather than keeping them in reserve for NANP expansion.

Does not provide the Canadian industry and regulatory authorities with increased flexibility and autonomy in the use of NANP numbering resources.

ANNEX C

Other NANP Expansion Proposals Considered

The following other NANP expansion proposals were considered but not accepted for detailed analysis for the reasons listed below.

- C.1.0 Postalized Structure (ZIP Codes)** - Two proposals were received recommending the use of U.S. postal zip codes as five-digit NPAs. Workshop participants agreed that expanding the NANP using a postalized structure (zip codes) is impractical for a variety of reasons. Those reasons include, but are not limited to:
- C.1.1** The areas identified with zip codes are not mappable with telephone numbers (i.e., room and floor of a building). Therefore, no one-for-one relationship is possible.
 - C.1.2** The need to change all existing NANP numbers (100% customer number changes). This is unacceptable from a human factor perspective.
 - C.1.3** Opening of the A digit in the NPA to allow “0” and “1” assignments. This is not feasible without changing (i.e., replacing) all existing NANP prefixes.
 - C.1.4** U.S. postal structures (i.e., zip codes) are not applicable in Canada or the Caribbean.
 - C.1.5** Options calling for five-digit NPA codes (e.g., Option E-2) were eliminated. The rationale for this is provided in Annex B.
 - C.1.6** There is no means for providing for non-geographic (i.e., SAC, ERC) resources.
- C.2.0 K Digit (eleventh digit) Service Identifier** - This proposal was offered to resolve the problems associated with the increase in the number of NPA splits. A single NANP number in the format NPA-NXX-XXXX which uses an eleventh digit to differentiate between services and/or applications e.g., home, office, fax, cellular, etc.

While this proposal has some positive aspects as it relates to human factors, the proposal presents the following concerns:

- C.2.1** Cannot be implemented in time to prevent near term NPA code relief situations.
- C.2.2** Services and/or application indicators (e.g., FAX vs. Voice) placed at the end of the number requires analysis of the full digit string in all cases.

- C.2.3** A Sub-Addressing option already exists in the ISDN numbering plan.
- C.2.4** Determining between ten-digit calls and eleven-digit calls would require timing or some other form of end-of-dialing determination.
- C.2.5** All five-digit line number expansion options (i.e., 1-C, 2-C and 3-C) were eliminated at INC 39. Rationale for this is provided in Annex B.
- C.2.6** Calling subscribers would have no way of knowing the correct last digit to dial causing confusion and mis-dialing. This is unacceptable from a human factor perspective.

C.3.0 Non-Disruptive Plan for NANP Expansion

C.3.1 Description of Plan

This proposed NANP Expansion Option uses five-digit NPA codes which, ultimately replace the existing three-digit NPAs. The two new digits are added after the existing NPA (i.e., NXX +XX).

It was suggested that a transition period as long as 20-100 years could be supported and that both three-digit and five-digit NPA codes would co-exist during that time.

C.3.2 Rationale for Elimination

C.3.2.1 Uniform Dialing

This Expansion Plan suggests that "abbreviated dialing" can be maintained indefinitely in areas where overlay NPA relief has been implemented. This implies that eight-, ten-, and twelve-digit dialing options could co-exist in these serving areas for up to one hundred years. This is completely inconsistent with the objectives of the INC Uniform Dialing Plan.

C.3.2.2 Permissive Dialing Period

The UDPO plan calls for a permissive period of from twenty to one hundred years. It is suggested that such an approach to transition would provide no incentive to either users or network operators to effect, or, even attempt to understand the changes required. The approach therefore defies the basic objective of using permissive dialing to effect change.

C.3.2.3 Fixed Number Length

This plan, because of the need to support both ten and twelve-digit numbers throughout the up to one hundred year transition period, effectively destroys the "fixed number length" design of the NANP. That is ten-digit and twelve-digit numbers must coexist indefinitely. This will have impacts on all network components

that are orders of magnitude greater than all of the other remaining expansion options that are fixed-length.

C.3.2.4 Increased Capacity – Yield

The original list of NANP expansion options contained a five-digit NPA plan (Option E-2). This Option was rejected in January 1997 because the number of new NPAs created (i.e., 79,200) "far exceeds the foreseeable demand for NPA codes".

This plan also calls for the introduction of five-digit NPAs. The rationale for eliminating Option E-2 applies to this Option as well, that is, there is no need for 79,200 new NPAs.

C.3.2.5 Twelve-Digit Limit

It has been agreed that the expanded NANP will not exceed twelve digits and that there will be an NPA Exhaust Mitigation component within those twelve digits (Assumption and Constraints item j).

The UDPO utilizes the full complement of digits (i.e., twelve) but only to create new NPA resources. Therefore, there is no capacity available for NPA Exhaust Mitigation in the UDPO plan.

C.4.0 Two-Digit Steering Code Plan

C.4.1 Description of Plan

This NANP expansion proposal calls for the introduction of a Two-Digit Steering Code (SC) field in front of existing ten-digit formatted NANP numbers. The two-digit codes would be in the XX format and therefore range from 00 through 99. Unique SC's would be assigned to every NANP geographic area on a state-by-state or country-by-country basis (e.g., Maine would be assigned SC99). Also, all service codes, such as SAC 800, would be allocated an SC. All NANP numbers would be twelve digits, and every SC would have the numerical capacity of the existing NANP (i.e., 6.4 billion numbers). It is further proposed that dialing within a SC area (i.e., intra SC) would retain the ten-digit format, while calls to different SC's (i.e., inter SC) would require twelve-digit dialing prefaced by a prefix.

C.4.2 Rationale for Elimination

The Two-Digit Steering Code expansion proposal was eliminated for the following reasons at INC 53.

C.4.2.1 Uniform Dialing

The Two-Digit SC Plan specifies ten-digit dialing on intra SC calls and twelve-digit plus dialing on inter SC calls. Thus, this plan violates the main objective of the INC Uniform Dialing Plan, that is all calls will be dialed with the same number of digits.

C.4.2.2 Permissive Dialing Period

Assessment Criteria 4.10 Evolution/Transition: The INC has recognized the need for a permissive dialing period to enable the users to migrate to any expansion plan. The Ten-Digit SC proposal specifies that a "flash-cutover" is required. This violates one of the INC's basic assumptions and raises serious and unresolved human factors considerations. Assumption and Constraint item m states that the expanded NANP should be implementable with sufficient time to permit both an orderly transition to the expanded format and provide sufficient numbering resources to meet industry requirements.

C.4.2.3 Increased Capacity – Yield

The original list of NANP Expansion options contained a five-digit NPA plan (Option E-2). This Option was eliminated in January 1997 because the quantity of numbers (i.e., NPA's) created "far exceeds the foreseeable demand".

The Two-Digit SC plan effectively increases the number of NPA codes by a factor of one hundred (i.e., XX x NXX, or, 100 x 800 = 80,000 NPA's). The assignment of a unique SC to a state or country with a very small population effectively "strands" millions (i.e., 6.4 billion NANP numbers for each SC) within that SC.

C.4.2.4 User Confusion

Concerns exist regarding the user's ability to relate the new SC's to existing geographic areas/service applications. This is based on the fact that there is no uniform rule to allow the user to derive post-expansion numbers from pre-expansion numbers. This situation is further exacerbated by the fact that there is no permissive dialing period possible with this plan.

C.4.2.5 Code Conflicts

The introduction of a new code field, which involves two-digit codes in the 00-99 format, introduces the potential for irreconcilable confusion for both customers and network components. Numerical ambiguities will be created between existing and new number sequences. For example, how does the network/customer determine between the existing 613 259 5000 and the new 613 259 5000 000 (i.e., 61 325 950 0000)). Further, and potentially even more serious, is the conflict between SC's in the 00 to 11 range and the existing NANP prefixes (e.g., 00, 01, 101XXXX, etc.). This could in fact require the creation of totally new dialing schemes with new prefixes or some new functional equivalents. Such conflicts could be eliminated by the restriction of SCs to exclude initial digits of 0 or 1.

C.4.2.6 Central vs. Decentralized Control

One of the main strengths of the NANP, and its ability to support the needs of all nineteen participating countries, rests in its uniformity of implementation. This has

been achieved to date through centrally focused control, planning and deployment of the numbers and the associated addressing plans.

There is a real concern that subdividing the NANP into one hundred "sectors" may well lead toward a more "locally" driven decision making process. Specifically, any state/country with the full capacity of the existing NANP at their disposal may adopt unique local procedures, which are not compatible with/beneficial to the balance of the NANP area. This therefore threatens the goal of uniformity and could have very serious negative impacts on the NANP and its users.

ANNEX D NANPA NPA EXHAUST PROJECTION

Each year, NANPA is responsible for providing an exhaust projection of the North American Number Plan (NANP). NANP exhaust is estimated by projecting the exhaust of the remaining NPAs. The following is a summary of the results of NANPA's exhaust analyses for 1999, 2000 and 2001.

1999 Analysis

In January 1999, NANPA presented a study that indicated that the NANP could exhaust anywhere from 2007 to 2012. This study examined the historical assignment rates of NPA codes as well as attempted to incorporate the impact of local exchange competition on overall Central Office demand rates.

2000 Analysis

In June 2000, using information gathered via the Central Office Code Utilization Survey (COCUS), the NANP was projected to exhaust between 2012 to 2019. This study however did not attempt to incorporate the impact of the FCC March 2000 Number Resource Optimization Order (FCC 00-104). This Order, among other things, ordered the national rollout of thousands-block number pooling in the top 100 Metropolitan Statistical Areas (MSAs).

Since the original study did not take into account national number pooling, a second study was conducted in September 2000. This study relied extensively on assumptions developed by NANPA in coordination with the North American Numbering Council (NANC). These assumptions were necessary since very little data existed about the potential impact of number pooling on Central Office code demand and NPA exhaust. The results of this analysis estimated NANP exhaust from 2015 to 2025.

2001 Analysis

In September 2001, another NANP exhaust analysis was performed. This analysis incorporated the same assumptions used in the September 2000 study. Further, this study relied upon data collected via the FCC-mandated Number Resource Utilization and Forecast (NRUF) reporting requirements contained in the first NRO Order. The results of this study estimated exhaust in 2025. Based upon modifications to the assumptions used in the study, the exhaust of the NANP could occur as late as 2034.

Note: The assumptions for 2000 and 2001 analyses can be found on the ATIS/INC web site as: NANPE-256 (put in web address) & NANPE-257 (put in web address).

ANNEX E NANP – EXPANSION OPTION EVALUATION MATRIX

(Page 1 of 2)

OPTIONS ASSESSMENT CRITERIA		OPTION # 1 (NPA+ X)			OPTION # 2 (N + NPA)			OPTION # 3 (NDC + NPA)			NOTES
		A	B	C	A	B	C	A	B	C	
4.1	HUMAN FACTORS	6.6	4.4	5.4	6.0	4.4	5.0	5.6	3.6	4.4	
	4.1.1 STABILITY	8.0	7.0	7.0	8.0	7.0	7.0	4.0	3.0	3.0	
	4.1.2 SIMPLICITY	6.0	2.0	4.0	8.0	4.0	6.0	7.0	3.0	5.0	
	4.1.3 EASY TO USE	6.0	5.0	5.0	6.0	5.0	5.0	7.0	6.0	6.0	
	4.1.4 CLARITY 8.0	3.0	6.0	3.0	1.0	2.0	5.0	1.0	3.0		
	4.1.5 DIALING	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
4.2	CALL PROC. & NETWORK OPS.	2.4	2.0	2.1	2.4	2.0	2.1	2.2	1.8	2.0	
	4.2.1 DIGIT ANALYSIS 4.0	3.0	2.0	4.0	3.0	2.0	3.0	2.0	1.0	vendor I/P	
	4.2.2 SIGNALLING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	need more info
	4.2.2.1 SS7 STANDARDS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	4.2.2.2 SS7 APPLICATIONS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	4.2.3 RECORDING & RATING	3.0 4.0	3.0 3.0	3.0 4.0	3.0 4.0	3.0 3.0	3.0 4.0	3.0 4.0	3.0 3.0	3.0 4.0	T1 I/P needed
	4.2.4 OPERATIONS SUPPORT 1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
	4.2.5 OPERATOR SERVICES	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
	4.2.6 911, ETC.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	Letter to NENA

NANP - EXPANSION OPTION EVALUATION MATRIX

(Page 2 of 2)

OPTIONS ASSESSMENT CRITERIA		OPTION # 1 (NPA+ X)			OPTION # 2 (N + NPA)			OPTION # 3 (NDC + NPA)			NOTES
		A	B	C	A	B	C	A	B	C	
4.3	LIFE EXPECTANCY	10	10	10	10	10	10	10	10	10	25 years
4.4	UTILIZATION/EFFICIENCY	8.0	6.0	4.0	8.0	6.0	4.0	4.0	3.0	2.0	
4.5	FUTURE REQUIREMENTS	7.0	8.0	5.0	7.0	8.0	5.0	7.0	8.0	5.0	Flex variable co/sw
4.6	INTER-NANP COUNTRY	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	Pros and Cons cancel
4.7	PUBLIC POLICY	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	no contradiction to public policy
4.8	UNIFORM AVAILABILITY	6.0	8.0	7.0	6.0	8.0	7.0	6.0	8.0	7.0	
4.9	ADDITIONAL DIGITS	7.0	9.0	6.0	7.0	9.0	6.0	7.0	9.0	6.0	c cost most b more co codes
4.10	EVOLUTION/TRANSITION	--	--	--	--	--	--	--	--	--	not enough info
4.11	SERVICE PROVIDER ADMINISTRATION NANPA (INCLUDES CODE REUSE)	4.0 7.0	3.0 8.0	3.0 9.0	4.0 7.0	3.0 8.0	3.0 9.0	4.0 5.0	3.0 6.0	3.0 7.0	
4.12	MITIGATE NPA RELIEF	5.0	7.0	6.0	5.0	7.0	6.0	5.0	7.0	6.0	
		67.5	69.9	61.5	66.9	69.9	61.1	61.3	64.9	57.4	

**ANNEX F
PRO/CON WORKSHEET****“A” OPTIONS****Option 1-A****Pros**

- *1A-P1 Easy to understand, as it adds a digit at the end of the NPA with a single, uniform rule.
- 1A-P2 An NPA will continue to be unique and be associated with a single geographic area.
- 1A-P3 Maintains a single pool of NANP-wide numbering resources that reduces the potential for inefficiencies associated with stranded resources.
- *1A-P4 No prefix is required to accomplish the transition because a 0 or a 1 in the new D digit of the four-digit NPA can be used as a transition indicator.
- *1A-P5 This Option retains the existing NPA code as the first three digits of the expanded area code, which maintains “an ERC-like” format for various services, e.g., 800 becomes 8000, 888 becomes 8880.
- 1A-P6 Creates no new administrative burdens on the NANPA, as a single pool of four-digit NPAs is established.
- 1A-P7 This Option provides the industry many possible choices in assigning future NPAs. It may be possible to continue to assign multiple NPA codes, all with the same first three digits to a given area so that the area can maintain its geographic identity. In areas where it is obvious that due to growth considerations, it would not be necessary to assign many more NPAs, a completely unrelated four-digit NPA could be chosen. These flexibilities do not form part of any other expansion option.
- *1A-P8 Does not require implementation of the INC Uniform Dialing Plan prior to implementation because there is no need for a prefix to implement this Option.
- *1A-P9 Enables all calls to be dialed with a uniform dialing plan of 11 digits.
- *1A-P10 Releases the 80 N9X formatted NPAs for immediate assignment, as they are not required for this or future expansion.
- *1A-P11 Enables switches to determine within the first four digits dialed whether the caller is dialing a 10- or 11-digit number during transition period.
- *1A-P12 Provides the Canadian industry and regulatory authorities with increased flexibility and autonomy in the use of NANP numbering resources.

1A-P13 Canadian networks and numbering resources can be insulated from external influence and factors that are not applicable in Canada (e.g., growth, politics, industry forums, etc.)

Cons

1A-C1 Imposes mandatory change to pre-expansion, 10-digit NANP numbering resource format (NXX-NXX-XXXX; e.g., 3-digit NPAs become 4-digit NPAs).

1A-C2 Requires all calls to be dialed with 11 digits (versus 10 digits on intra-NDC calls in Option 3).

1A-C4 Does not provide the regulatory authorities of other nations or regions within the NANP with increased flexibility and autonomy in the use of numbering resources.

1A-C6 Canadian and Caribbean international inbound routing situation remains unresolved for non geographic NPA codes.

1A-C7 Jeopardizes some existing "vanity" numbers greater than seven digits by inserting the new digit inside the existing 10-digit NANP number.

*1A-C8 Prohibits the opening of the D digit to either 0 or 1 prior to the implementation of this Option and during the transition period.

1A-C9 Requires equipment to analyze four digits to determine if the caller is dialing a 10- or 11-digit number during the permissive dialing period.

1A-C10 Requires the caller to remember to add a 0 after the 3-digit area code.

1A-C11 Current ERC rule will be impacted--e.g., 888 would become 8880.

Option 2-A

Pros

2A-P1 An NPA will continue to be unique and be associated with a single geographic area.

*2A-P2 Maintains a single pool of NANP-wide numbering resources that reduces the potential for inefficiencies associated with stranded resources.

*2A-P3 Will allow the D digit to be released prior to implementation of 11-digit numbers.

2A-P4 Preserves the ERC concept of matching last two digits of NPA.

2A-P5 Creates no new administrative burdens on the NANPA, as a single pool of four-digit NPAs is established.

2A-P6 Easy to understand and use by the general public.

*2A-P7 Releases the 80 N9X formatted NPAs for immediate assignment, as they are not required for this or future expansion.

Cons

*2A-C1 Requires having implemented the INC Uniform Dialing Plan, i.e., eliminating the 1+ prefix, if the prefix "1" is to be used to transition to this Option.

*2A-C2 Requires the use of a prefix, such as "1," to transition to the plan. If the INC Uniform Dialing Plan is not implemented, a prefix other than "1" is required.

2A-C3 Imposes mandatory change to pre-expansion, 10-digit NANP numbering resource format (NXX-NXX-XXXX; e.g., 3-digit NPAs become 4-digit NPAs).

2A-C4 Requires all calls to be dialed with 11 digits (versus 10 digits on intra-NDC calls in Option 3).

*2A-C5 Does not provide the Canadian industry and regulatory authorities with increased flexibility and autonomy in the use of NANP numbering resources.

2A-C6 Does not provide the regulatory authorities of other nations or regions within the NANP with increased flexibility and autonomy in the use of numbering resources.

2A-C7 Canadian networks and numbering resources are not insulated from external influence and factors that are not applicable in Canada (e.g., growth, politics, industry fora, etc.).

2A-C8 Canadian and Caribbean international inbound routing situation remains unresolved.

2A-C9 Not easy to understand and use by the general public.

Option 3-A

Pros

*3A-P1 Requires no changes to the subscribers' pre-expansion 10-digit NANP numbers (i.e., NPA + NXX + XXXX).

3A-P2 Very easy for the public to understand and use.

*3A-P3 Pre-expansion dialing procedures remain intact for Intra-NDC calls (i.e., 10-digit dialing).

*3A-P4 The assignment of an NDC to Canada would provide the Canadian industry and regulatory authorities with increased flexibility and autonomy in the use of numbering resources allocated to Canada.

3A-P5 The assignment of separate NDCs (up to eight with a single-digit NDC) to countries or regions within the NANP could provide regulatory authorities in such countries and regions with increased flexibility and autonomy in the use of numbering resources.

*3A-P7 The NDC Option facilitates the routing of international inbound calls destined for a specific NDC directly to that NDC, i.e., Canada.

3A-P8 Canadian networks and numbering resources are insulated from external influence and factors that are not applicable in Canada (e.g., growth, politics, industry fora, etc.).

*3A-P9 Releases the 80 N9X formatted NPAs for immediate assignment, as they are not required for this or future expansion.

*3A-P10 Will allow the D digit to be released prior to implementation of 11-digit numbers.

3A-P11 Preserves the ERC concept of matching last two digits of NPA.

Cons

*3A-C1 Requires having implemented the INC Uniform Dialing Plan, i.e., eliminating the 1+ prefix, if the prefix “1” is to be used by this Option.

*3A-C2 Requires the use of a prefix, such as “1,” to transition to the plan. If the INC Uniform Dialing Plan is not implemented, a prefix other than “1” is required.

*3A-C3 Requires using a prefix to place calls between NDCs, thereby eliminating the possibility of uniform dialing within the USA.

3A-C4 This plan could strand NPAs within sectors that don’t need them.

*3A-C5 Not easily understood by callers because there is no uniform rule to derive post-expansion numbers from pre-expansion numbers. Specific geographic knowledge of sectorization is required of callers during transition.

3A-C6 Will be difficult to get U.S. FCC and State regulatory approval.

3A-C7 Adds a new functional field and concept to the NANP by introducing NDCs, and therefore requires a different type of customer and vendor awareness.

*3A-C8 Ambiguities between NDCs and the first digit of geographic area codes would result, in misdialed calls and calls completed to the wrong number.

3A-C9 Callers to roaming wireless customers might incorrectly dial the NDC in which the wireless terminal is temporarily located instead of the NDC that is part of the number assigned to the wireless terminal.

3A-C10 Provides only Canada country identification within the NDC field; does not provide capability to identify every country within the NANP in the single-digit NDC.

Option 4-A

Pros

*4A-P1 Does not require implementation of the INC Uniform Dialing Plan prior to implementation because there is no need for a prefix to implement this Option.

*4A-P3 Will allow the D digit to be released prior to implementation of this Option.

4A-P4 Easy for public and regulators to understand.

4A-P5 Enables switches to determine within the first two digits dialed whether the caller is dialing a 10- or 11-digit number during transition period.

- 4A-P6 Preserves the ERC concept of matching last two digits of NPA.
- 4A-P7 An NPA will continue to be unique and be associated with a single geographic area.
- 4A-P8 Creates no new administrative burdens on the NANPA, as a single pool of four-digit NPAs is established.
- 4A-P9 Maintains a single pool of NANP-wide numbering resources that reduces the potential for inefficiencies associated with stranded resources.
- *4A-P10 No prefix is required to accomplish the transition because a 9 in the new B digit of the four-digit NPA can be used as a transition indicator.

Cons

- 4A-C1 Imposes mandatory change to pre-expansion, 10-digit NANP numbering resource format (NXX-NXX-XXXX; e.g., 3-digit NPAs become 4-digit NPAs).
- 4A-C2 Requires all calls to be dialed with 11 digits (versus 10 digits on intra-NDC calls in Option 3).
- *4A-C3 Does not provide the Canadian industry and regulatory authorities with increased flexibility and autonomy in the use of NANP numbering resources.
- 4A-C4 Does not provide the regulatory authorities of other nations or regions within the NANP with increased flexibility and autonomy in the use of numbering resources.
- 4A-C5 Canadian networks and numbering resources are not insulated from external influence and factors that are not applicable in Canada (e.g., growth, politics, industry fora, etc.).
- 4A-C6 Canadian and Caribbean international inbound routing situation remains unresolved.
- 4A-C7 Jeopardizes some existing "vanity" numbers greater than nine digits by inserting the new digit inside the existing 10-digit NANP number.
- *4A-C8 The insertion of the digit 9 between the first and second digits of all new and existing NPA codes (e.g., 613 becomes 6913, 212 becomes 2912, 800 becomes 8900, etc.) may be difficult to explain, may be hard to understand by the general public, and is user unfriendly.

*4A-C9 Does not allow release of the 80 N9X formatted NPAs for immediate assignment, as they are required for this expansion.

“B” OPTIONS

Option 1-B

Pros

*1B-P1 Easy to understand, as it adds a digit at the end of the NPA and a digit on the front of the CO code with a single, uniform rule.

*1B-P2 No prefix is required to accomplish the transition because a 0 or a 1 in the new D digit of the four-digit NPA can be used as a transition indicator.

*1B-P3 This Option retains the existing NPA code as the first three digits of the expanded area code, which maintains “an ERC-like” format for various services, e.g., 800 becomes 8000, 888 becomes 8880.

*1B-P4 Does not require implementation of the INC Uniform Dialing Plan prior to implementation because there is no need for a prefix to implement this Option.

*1B-P5 Enables all calls to be dialed with a uniform dialing plan of 12 digits.

*1B-P6 Releases the 80 N9X formatted NPAs for immediate assignment, as they are not required for this or future expansion.

*1B-P7 Enables switches to determine within the first four digits dialed whether the caller is dialing a 10- or 12-digit number during transition period.

*1B-P8 Provides the Canadian industry and regulatory authorities with increased flexibility and autonomy in the use of NANP numbering resources.

1B-P9 Provides additional CO code resources

1B-P10 Only B Option that can be transitioned to in an acceptable manner by adding a double 00 at the end of the NPA code.

1B-P11 Canadian networks and numbering resources can be insulated from external influence and factors that are not applicable in Canada (e.g., growth, politics, industry forums, etc.)

Cons

*1B-C1 Prohibits the opening of the D digit to either 0 or 1 prior to the implementation of this Option and during the transition period.

1B-C2 Imposes mandatory change to all NANP numbering resources (i.e., 3-digit NPAs become 4-digit NPAs, and 3 digit CO codes become 4-digit CO codes).

1B-C3 Requires all calls to be dialed with 12 digits.

1B-C4 Does not provide the regulatory authorities of other nations or regions within the NANP with increased flexibility and autonomy in the use of numbering resources.

1B-C5 International inbound routing situation remains unresolved for non-geographic NPA codes.

1B-C6 Jeopardizes existing "vanity" numbers.

Option 2-B

Pros

Cons

2B-C1 Imposes mandatory change to all NANP numbering resources (i.e., 3-digit NPAs become 4-digit NPAs, and 3-digit CO codes become 4-digit CO codes).

2B-C2 Requires all calls to be dialed with 12 digits.

2B-C3 These options do not provide the Canadian industry and regulatory authorities with increased flexibility and autonomy in the use of NANP numbering resources.

2B-C4 These options do not provide the regulatory authorities of other nations or regions within the NANP with increased flexibility and autonomy in the use of numbering resources.

2B-C5 Canadian networks and numbering resources are not insulated from external influence and factors that are not applicable in Canada (e.g., growth, politics, industry fora, etc.).

2B-C6 International inbound routing situation remains unresolved.

2B-C7 Jeopardizes existing "vanity" numbers.

Option 4-B

Pros

Cons

4B-C1 Imposes mandatory change to all NANP numbering resources (i.e., 3-digit NPAs become 4-digit NPAs, and 3-digit CO codes become 4-digit CO codes).

4B-C2 Requires all calls to be dialed with 12 digits.

4B-C3 These options do not provide the Canadian industry and regulatory authorities with increased flexibility and autonomy in the use of NANP numbering resources.

4B-C4 These options do not provide the regulatory authorities of other nations or regions within the NANP with increased flexibility and autonomy in the use of numbering resources.

4B-C5 Canadian networks and numbering resources are not insulated from external influence and factors that are not applicable in Canada (e.g., growth, politics, industry fora, etc.).

4B-C6 International inbound routing situation remains unresolved.

4B-C7 Jeopardizes existing "vanity" numbers.

4B-C8 The insertion of the digit 9 between the first and second digits of all new and existing NPA codes (e.g., 613 becomes 6913, 212 becomes 2912, 800 becomes 8900, etc.) is difficult to explain, is hard to understand by the general public and is user unfriendly.

4B-C9 Does not release the 80 N9X formatted NPAs for immediate assignment, as they are required for this expansion.

Common Pros

1. Maintains an integrated NANP under Country Code 1.
2. Enables a permissive dialing period in which both 10- and 11-digit numbers can be dialed and completed.

Common Con

Requires reprogramming of terminal equipment, including but not limited to wireless devices.